

MAXIMUM POWER GAMING

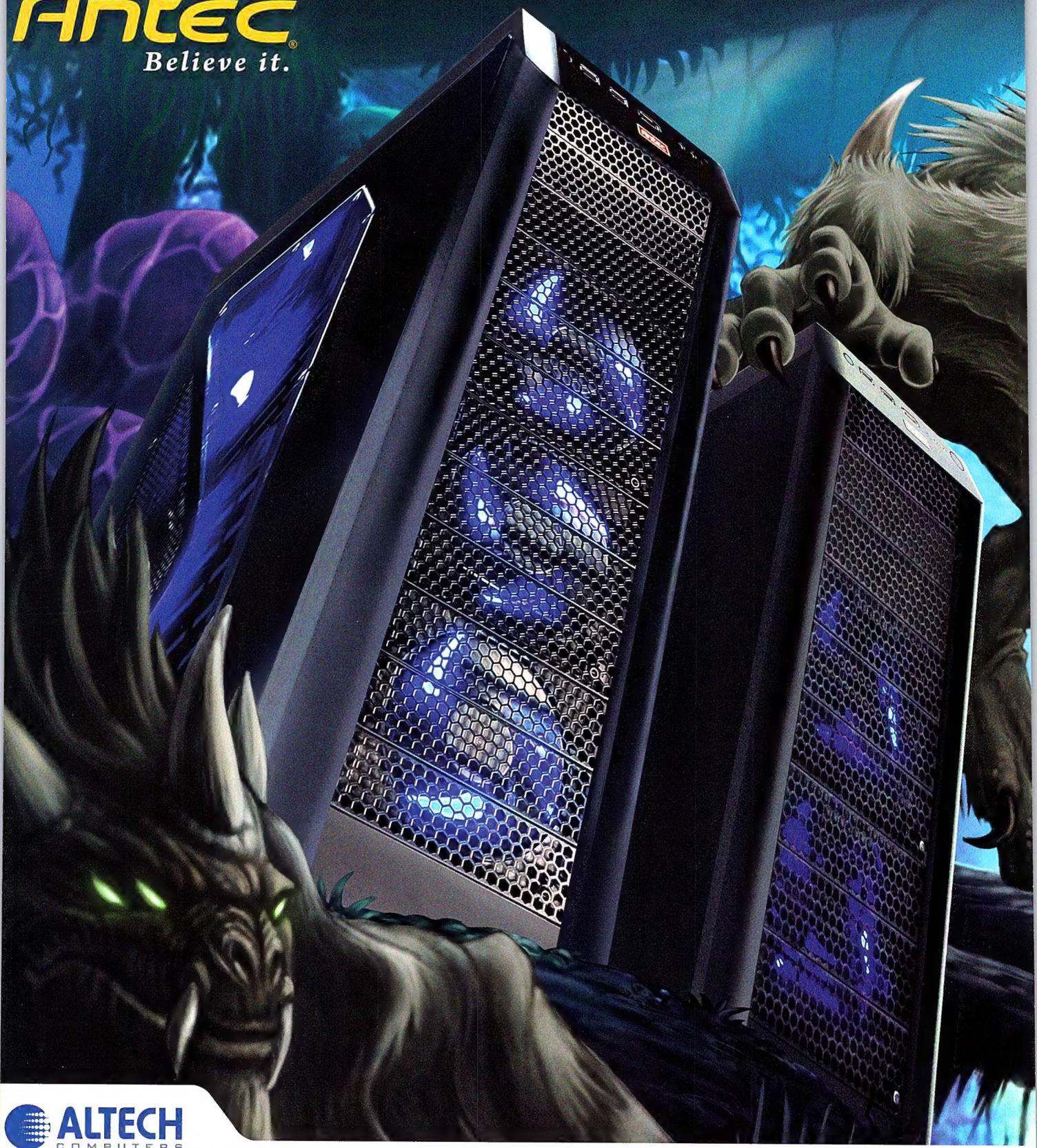
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OUT OF THIS WORLD!

EDHEAD

If you build it...

I love this time of year.

The lead up to Xmas is always fun. You've got that general end-of-year buzz, coupled with the knowledge that soon you'll be on holidays (we will, anyway), living it up, and generally relaxing from a busy year's end. There's great movies coming out, too, and that's always nice, but what really gets us salivating is all the cool tech and games that pops up at the end of the year.

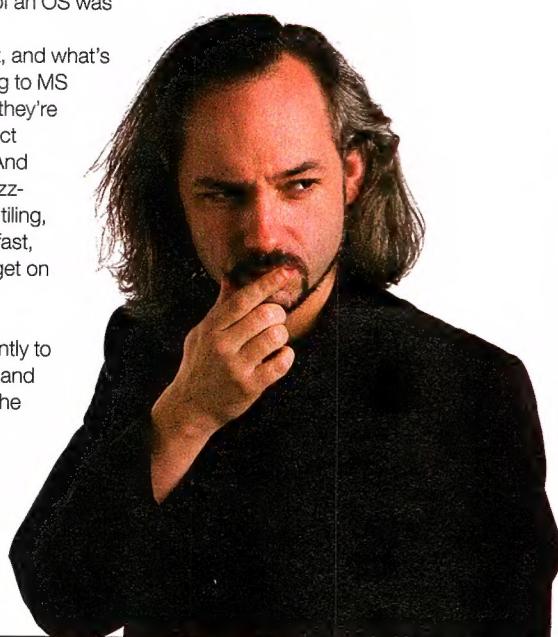
This year's been a particular whopper, and it's not even over yet!

Firstly, a brand new version of Windows – and, even more surprising, it's actually good! I remember when XP launched, and the good will that Microsoft got from it. It was a solid product and a real revolutionary step from previous versions of Windows. Vista, on the other hand, was like a bad joke; it was as if Steve Ballmer lost the worst bet of his life, and thus that dog of an OS was foisted upon us.

Windows 7 undoes all that, and what's been very amusing is chatting to MS managers and execs – even they're relieved to have an OS product they can be proud of again. And they should be. For all its whizz-bang effects (shake, window tiling, and all that), to me, it's just a fast, unobtrusive OS that lets me get on with what I love.

Gaming.

I took the opportunity recently to build an entirely new system, and man... it's like being reborn. The difference between my aging dual-core (hey, it worked!) XP system and my new Core i7 and Win7 system is like... well, it's like light and dark. It kind of helped that I also switched up my OS drive



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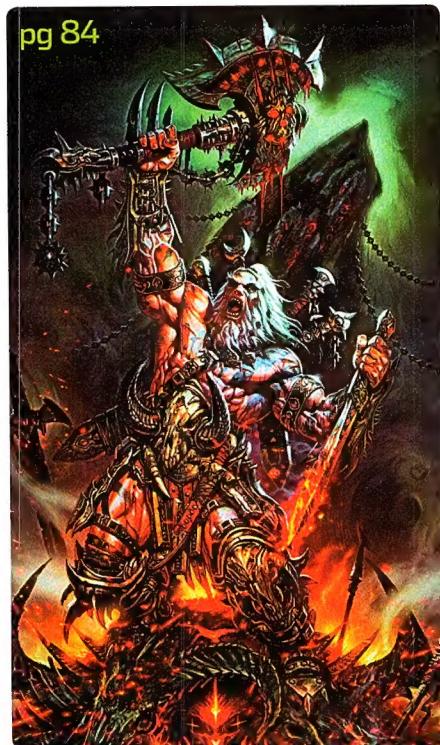
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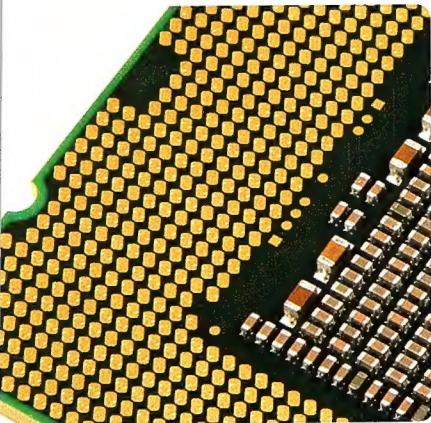
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Processor speed exhausted in 75 years

Moore's law kicks processor speeds where it hurts.



Processors have increased in sheer performance year on year ever since the inception of the very first design many years ago, bringing in faster speeds and more advanced designs that have pushed the industry onwards faster than many could have predicted.

However all this improvement is eerily linear, following the prediction that Gordon Moore made forty years ago that computing speeds would double every two years - first shown with simple clockspeed increases to almost 4GHz stock, and shown today with additional processing cores.

But all this seems to be coming to a potential close in the future as physicists Lev Levitin and Tommaso Toffoli, both from Boston University in Massachusetts, threw a deadline of 75 years down based on pure theoretical knowledge.

Pointing at the properties of the materials we're using today and even at the Quantum processors that appear to be the next step, they believe that the boundary will be reached in a single lifetime - bringing Moore's Law to a close.

Publishing the minimum possible time for a basic calculation to finish gave their paper some weight, highlighting the fact that Quantum processors become unstable with increasing external components; in other words, they become increasingly unreliable as they become more complex.

This theory is of course just a theory for now and there remains a slim possibility that we'll discover knowledge in the future to get around that hurdle, but for processor designers now they've got a performance ceiling to aim for.

MSI's P55-GD80 motherboard BIOS updated, brings better performance

Labs Update: MSI's BIOS gets a nice update.

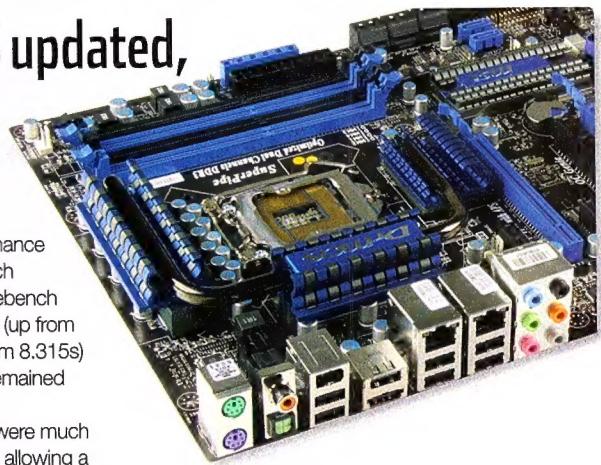
When we first had a look at MSI's premium high-end board in Issue 105 what we found was perhaps less than stellar overclocking performance, something that perplexed and bamboozled us a little - and something that we've found to be changed.

Speaking to MSI's Product Manager Jerry Lee, he got us in contact with a BIOS engineer at MSI who was able to provide us with the latest revision of the BIOS that, at least on the surface, appeared to clear up all our issues with the board.

Reflashing our P55-GD80 sample with this latest revision, plonking in the Core i7 870 chip, 4GB of DDR3 1600MHz 8-8-8-24 and whacking a Noctua NH-U12P SE2 heatsink on top, we set about running our stock performance tests to see how this newer BIOS revision measured up.

In the image below the performance is clearly higher across pretty much every facet; scoring 18268 in Cinebench (up from 16928), 26.91s in PiFast (up from 27.21s), 7.776s in wPrime (up from 8.315s) though the memory bandwidth remained relatively unchanged.

Our overclocking endeavours were much improved from that original BIOS, allowing a maximum stable speed of 4140MHz to be hit which resulted in a huge performance increase. To reach this clockspeed Intel's EIST technology had to be disabled in the BIOS, but aside from this small bugbear the issues seem to have been completely resolved. It's even faster at stock than the prerelease GIGABYTE mobo we tested the Core i7 870 in just before launch.



It's a good sign that those adopters of MSI's P55 tech at launch can look forwards to a board identical in overclocking prowess to the competition, and there's no reason now (apart from price) that we can think of to stop us recommending this board as a decent choice. It also goes to show the importance of a solid BIOS.

It's time to gather together to heap praise and rose-petals on the best posts and posters that Atomic has to offer. This month we had a near unanimous winner. And that winner is...

FOODS! For his highly amusing tangle with the law! <http://forums.atomicmpc.com.au/index.php?showtopic=22373>

He walks away with - as soon as he tells me where to send it - a shiny new Cybersniper gaming mouse. Of course, there were a mess of other great posts this month too!

Mac Dude shows us his old school

technical skills on some new school technology. <http://forums.atomicmpc.com.au/index.php?showtopic=22233>

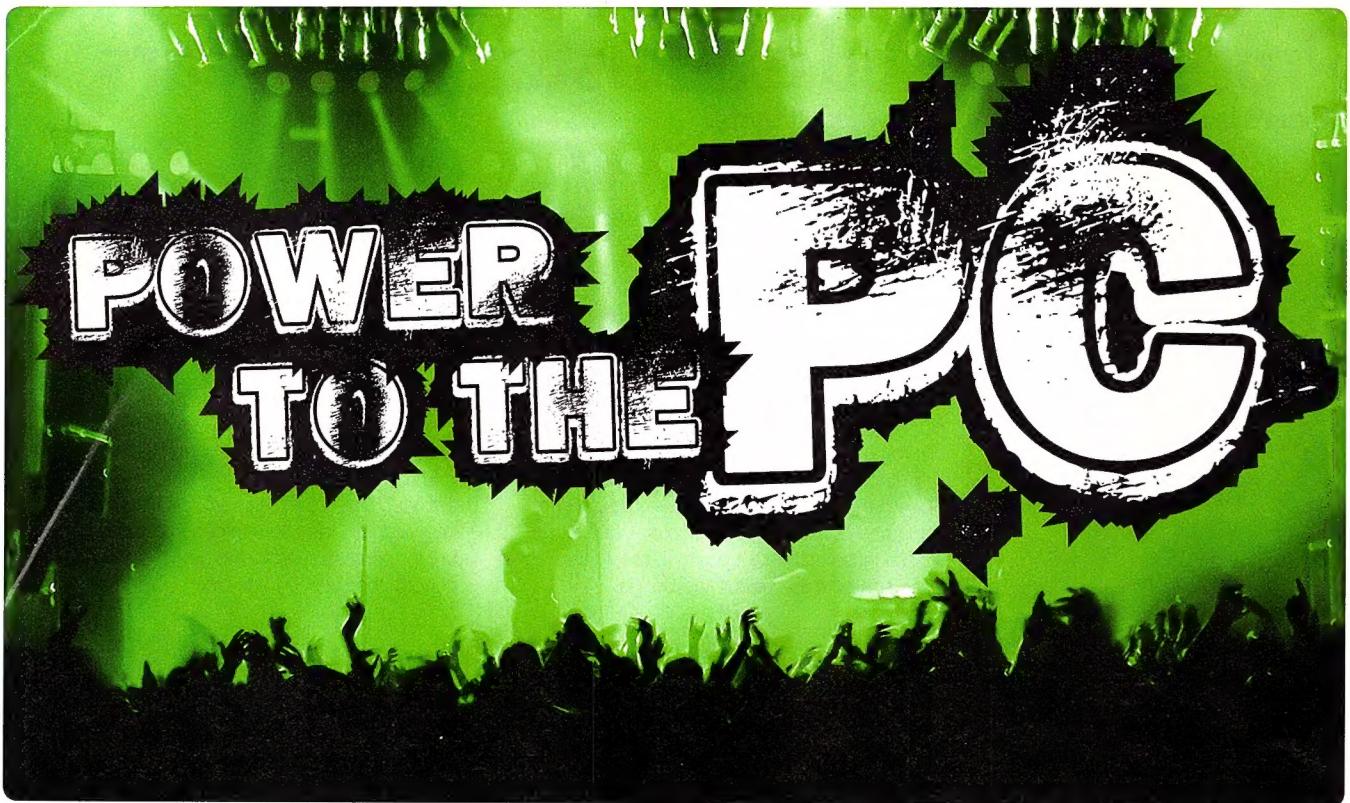
1shot gets creative in a shared house. <http://forums.atomicmpc.com.au/index.php?showtopic=23128&st=0&p=462704#entry462704>

evelyn, gets passionate about gifts... <http://forums.atomicmpc.com.au/index.php?showtopic=22168>

Rion, for his 'are games art?' post. <http://forums.atomicmpc.com.au/index.php?showtopic=22534>



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Melbourne Tour!

Atomic's second Power to the PC Tour, and final wrapup.

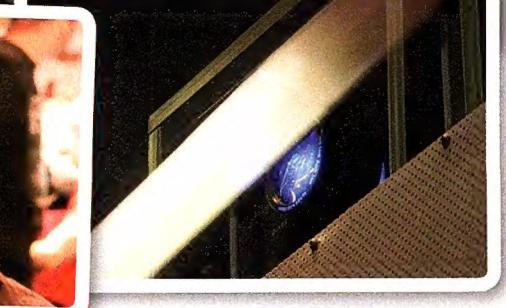
On the 22nd of September of 2009, Atomic brought you the first Power to the PC Tour - probably the first one in the whole of Australia. We thought it was so good we did it all over again just last week on the 1st of October, heading to Monash University in Caulfield and bringing with us all the pieces of a very Atomic event.

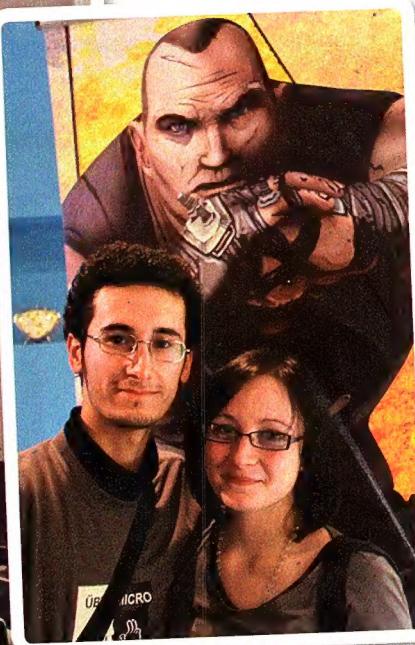
Again a huge shout out to the sponsors of the event that helped put on such a successful night, bringing tech and knowledge to the crowd with exclusive info and a zesty passion.

First off the rank was MSI's Albert Su, taking us through MSI's fancy mobo overclocking tech as well as their graphics card heatsinks. He brought along some P55 motherboards to ogle, and also brought MSI's 4890 Cyclone card.

Intel was represented by Technology Manager Graham Tucker, who wandered through the aisles of transistors within a processor and cast his considerable knowledge to all those avid Atomicans listening in the audience. Making reappearance was the 300mm wafer of Nehalem dies, worth a pretty penny to those who have the means to chop the chips and sell them.

Kingston's products and technologies were explained by Marites Bairstow, and she delved into the reasoning behind the Intel/Kingston





SSD partnership as well as why RAM has such impressive heatsinks. She also brought along some cool kits to look at, SSD kits and other goodies.

Samsung's Assistant Product Manager Eddy Jung stepped in at the last minute to guide Atomicans through 3D monitor tech and some very cool developments with refresh rates up to 240Hz in the coming years - and he even brought a monitor/3D goggle pairing to give away!

2K Games again gave us exclusive prerelease code for Borderlands on PC, letting Melbourne-based Atomicans get their





chance to blast away in the funky cel-shaded universe. This is still long before release; if you weren't at the Tour, there's no way you'd have gotten to play it for quite some time!

The gaming rigs we had to play on were brought by Team Immunity, their beefy rigs more than enough to chew through Borderlands and spit out slightly crumpled frames to hefty CRT monitors.



Simply Fast: The New GIGABYTE P55A-series of Motherboards

The continual improvement of technologies and manufacturing processes has allowed modern PCs to evolve from cumbersome, micro chip-laden platforms with dedicated functionality to high performance, multi-function systems with limited numbers of highly integrated chips. Continuing in this trend, the introduction of the Intel® P55 chipset together with the LGA 1156 Core i7/Core i5 processors delivers advantages such as a smaller footprint with its new 2 chip platform, superfast integrated memory controllers in the processor, lower power consumption and higher performance.

Other exciting new developments include the launch of the media-rich Microsoft® Windows® 7 operating system while industry leaders such as NEC, Marvell and Seagate ready their cutting edge USB 3.0 and SATA Revision 3.0 technologies for accelerated management of media on the new operating system. As the leader in motherboard innovation, GIGABYTE quickly adopted these futuristic technologies with the new P55A-series of motherboards that feature USB 3.0, SATA Revision 3.0 (6Gbps) and a 3x USB power boost – essentially 333 onboard acceleration!

The GIGABYTE P55A-series delivers unparalleled performance with SuperSpeed USB 3.0 technologies from NEC and SATA Revision 3.0 technologies from Marvell mounted directly onboard; this is superior to a makeshift add-on card solution that could create a bottleneck at the PCI-E slot when 2 or more SATA 6Gbps devices are attached to it. GIGABYTE P55A motherboards also provide an unprecedented 3x USB power boost on all USB ports for even the most power hungry USB devices. There are also all the usual technologies from GIGABYTE that include Ultra Durable™ 3, AutoGreen, DES2 and GIGABYTE Smart 6 for easier and smarter PC system performance, power and security management.

GIGABYTE 333 Onboard Acceleration USB 3.0 – 10x Super Speed



World's first USB 3.0 logo certified solution from NEC

GIGABYTE P55A motherboards feature the next-generation SuperSpeed USB 3.0 interface from NEC that provides a 10x data transfer speed boost over USB 2.0. Data transfer between the PC and USB 3.0 devices is enhanced through dual-simplex transfer for simultaneous bi-directional data flow.



USB 3x Power Boost



Umost compatibility with 3x USB power boost

GIGABYTE P55A motherboards introduce a unique new USB power design that effectively triples the power output from all USB ports. The result is unequalled USB device stability due to sufficient power delivery from a single USB port. This also frees-up USB ports for additional USB devices.



SATA 3.0 – 4x Speed via RAID 0



World's First SATA Revision 3.0 solution provider from Marvell

The very latest advancement in storage technology is SATA Revision 3.0 that effectively doubles the data transfer speed compared to SATA 2.0. GIGABYTE is working closely with Marvell to introduce SATA 3.0 on the full range of P55A motherboards. When using RAID 0 (Striping) mode, SATA Revision 3.0 can enable a data transfer boost of up to 4x over SATA Revision 2.0.



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GIGABYTE P55 Series Motherboards



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GA-P55A-UD3 GA-P55MA-UD4

*Available features vary by model. Please visit the GIGABYTE website to see a complete listing of motherboard model features.

For additional information about the GIGABYTE P55A series motherboards, please visit the GIGABYTE website at: <http://www.gigabyte.com.tw/Products/Motherboard/Default.aspx>

GIGABYTE™

GEARBOX

GEARBOX

Xmas Edition!



2.



3.





1. TiVo

Price \$699 Website www.mytivo.com.au

It's not really a new product, but since this Xmas edition of Gearbox is all about the best stuff to get your nearest geek (and that could just be you, you know), we still think the TiVo rates pretty high.

In one box you get HD digital broadcasts, a seven-day TV guide, ability to pause and rewind television shows, set it up to record anything with your favourite actors or keywords (I'll never miss a cage match again!), the ability to record every episode of your favourite shows (even if they get shifted around), and... really do you want any more? Well, you can play Sudoku, too, but frankly, we'll be too busy watching TV.

2. Creative ZEN X-Fi2

Price from \$169.95 Website www.creative.com/zenxfi2

Creative's been synonymous with solid, reliable and pretty damn groovy MP3 and media players for years, but thankfully the company is still not willing to rest on its well earnt laurels.

Its latest effort, the Creative ZEN X-Fi2 is not only cool to look at in itself; it's not just that it comes in 8-, 16- and 32GB options; nor is it the fact that it features a 3in LCD screen... but that screen is now touch sensitive!

And we like touching.

Considering the X-Fi2 supports iTunes Plus, FLAC lossless, and has a microSD slot for even more expansion, this is one helluva player. Want.

3. Edifier Esiena iF360

Price \$599 Website www.edifier-international.com

Of course, the other cool MP3 player du jour is the iPod/iPhone, and for those who fall on the Apple side of the mobile music persuasion, there's this new home audio solution from Edifier.

The Esiena iF360 has solid sound across the spectrum, docks your phone or iPod, has video out, plays CDs, FM digital radio, an SD card reader and a USB port. All this on top of being able to play MP3s and videos off your iPod. It's pretty much the only unit you need for watching and listening to everything you could want. And it's sexy to boot!

4. Canon EOS 1D Mark IV

Price TBC Website www.canon.com.au

There's nothing quite like feeling a heavy load of tech settle in the palm of your hand.

And man, is Canon's latest EOS one heavy, and cool, load of photographic tech.

The Mark IV features full HD video recording, 10fps continuous shooting (that's 120 shots in a single burst!), an ISO range of 100-12,800 (gaspl!), a 45-point area auto-focus system, and a neat and crisp 3in screen.

Oh, yeah, and a 16mp CMOS censor. Oh, the happy snaps you could take with this – just pointing it at people will make them joyous!

5. WD TV Live

Price \$199 Website www.westerndigital.com.au

In a perfect world, we'd all have wonderful HTPCs packed with super quiet storage, powerful enough for all your decoding needs and yet with room for full HD files in the hundreds. But getting there can be tough, and, for now, most people still have files stored all over their network. If you want to get those files on your TV at the touch of a button, Western Digital's latest might be mana from heaven.

WD TV Live is a super small media player that plugs into your network and your TV, which can then stream media from PCs and Macs, NAS devices, USB sticks, or just about any other storage device, straight to your TV. And it's fully HD ready, capable of playing MKV files and other HD formats. With an easy to browse UI, small form factor, and easy set up, it's the first thing any connected and media-savvy house needs.

OS: Future Shock

Jake Carroll looks into the future of your favourite operating systems.

If you place any faith in the words of Ballmer, Jobs or Ellison, the here and now is all-important. Everybody recognises them as sensationalists of the most perfected and inspirational form, but equally, they are recognised for their innovation and courage. The truth behind the bright lights and slick presentations, however, is that these men command the focus of the world around them through their intelligent and almost manipulative control of the operating systems which their respective companies produce. They've got plenty of other tricks up their sleeves.

This month, we're going to peer a little way into the future, to give you a warm green understanding of what you'll probably be playing with in the next two to three years, on your not so humble desktop, laptop, small-top or tablet!

The more things change

Operating systems in their current form are pretty slick: multi-touch, Surface, wobbly widgets and cool desktop effects all make for some pretty enjoyable user experiences. In the next couple of years, there will be some obvious disruption taking place under the hood. Key focus areas for next generation operating systems and their developers are (but are not limited to):

- The way storage and file systems are handled.
- How processes are executed, and the impact of parallelism.
- Moving things away from the CPU and towards the GPU.
- Network scalability.

The future of storage and file systems

We're already seeing the beginnings of a new era in storage, or at the very least, how we manage our storage. Along with SSDs, TRIM commands and high performance file systems, the generic notion of how we actually look after our 0s and 1s is changing. A little while ago, a bunch of very intelligent folks started thinking about how storage currently works, compared to how they think it should work. A few different ideas have been thrown about, but

the consensus is that the way we actually look after our hard disk volumes, partition them, clean them and shove them together to make faster ones is, for the most part, stupid. So what is being done to fix the stupidity?

In the next two to three years, you'll see scenarios where complex file system construction and disk management tasks are abstracted into near English sentences. The beginnings of this are in the revolutionary ZFS from Sun Microsystems. The way we look after the data as it passes through our system is also changing. Going out the window are the days of



simply presenting a block device, then putting it onto a mount point, and landing some data onto it. For the majority, this has come about because of the immense wealth of CPU cycles we now have available to us. Using custom engineered silicon is a thing of the past, considering we have all the logic grunt we need in CPUs.

Multiple vendors are taking a holistic, self-managing approach in their next gen storage. The idea is that when a user sprays data at a disk, there will be a bunch of discrete functions taking place, abstracted away from the user and the disk storage device itself.

Here, we actually tier storage so that it passes through the very fastest components first, intelligently processing our data, not through silicon but through CPU time, thus giving us more flexibility for manipulation. In the most common examples, the intelligent file systems and kernels of tomorrow will use a full combination of DRAM, SSD and mechanical HDD media to get the data to a place it belongs, rather than treating any of them as a 'dumb block device'. In doing this, we can perform cryptographic techniques on the fly, compression, any checksum method we wish and data migration/redundancy assurance, all inside the space of CPU cycles, rather than on RAID silicon or controllers that are purpose built. Faster in, faster out!

Don't look so shocked. SSD isn't the fastest kid on the block, nor is the most efficient means of using an SSD to run an operating system directly off it. It's all about data being transient, and in the right places at the right times. These are the methods of the next generation of storage management techniques, making their way to a future OS near you.

The future of processing

The future just might be in parallelism, and how to achieve it. The end game of parallelisation is to decrease execution time. A while ago we realised that the MHz and GHz war was

surprises there.

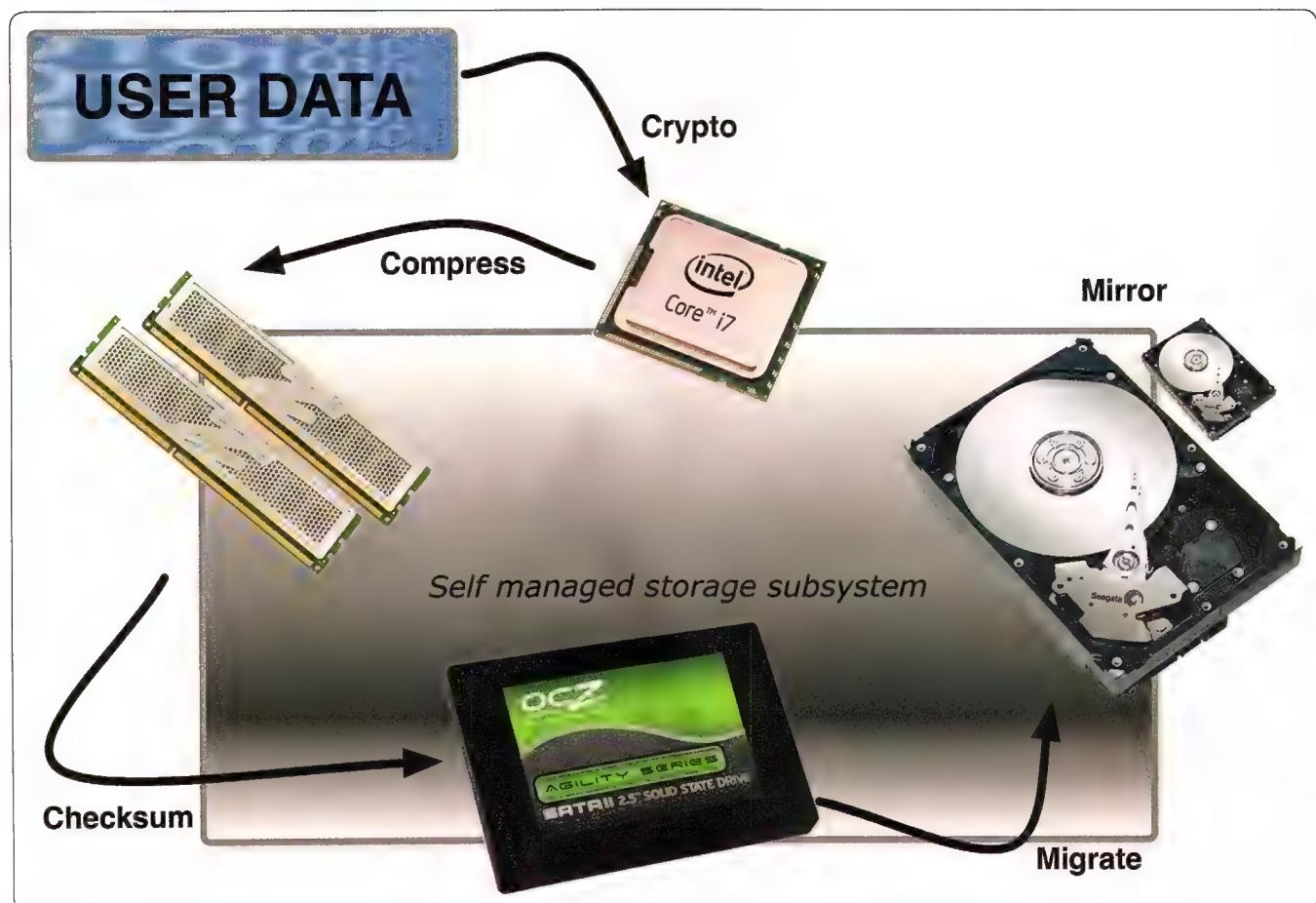
OS vendors are doing their best to address the underutilisation of SMP capable CPUs at a deeper level – not just writing better software, but writing better schedulers and more highly scalable operating systems. In the simplest sense, there are four methods of scaling multi processor workloads:

- The MPI (Message Passing Interface).
- Automatic Parallelisation (getting the compiler to do the work for us).
- OpenMP.
- The Hybrid Programming Model.

OS vendors are doing their best to address the underutilisation of SMP capable CPUs at a deeper level...

over. Cores upon cores upon cores became the name of the game. Excellent stuff, but has anybody really made significant use of symmetric multiprocessing (SMP) to the extent that they should have? Typically, the software we run on our desktops and laptops for everyday use doesn't use SMP to the extent that it perhaps could, or to the extent that is available to us. No

All of these methods of making software behave in a parallel way are reliant upon the programmer and the way the software interacts with the hardware, apart from one. The Hybrid Programming Model is a brave step forward in terms of SMP. Big news in the parallelisation game is, surprisingly, the openness of Apple's Grand Central Dispatch (GCD), now found



The general construct of next gen media usage as a storage subsystem hierarchy.

running on Mac OS X, OpenBSD, FreeBSD and a small host of other edgy operating systems.

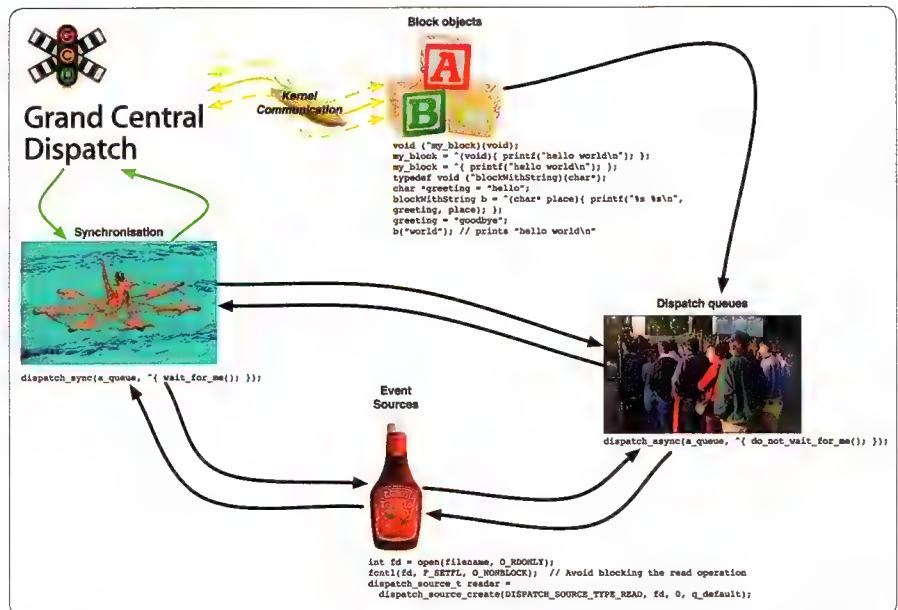
The excitement of such a technology is because of the simplification possible when dealing with complex code, and the performance gains that can be had with little effort. To put it into context, in using a generic threading model such as POSIX Threads (pThreads) or OpenMP, we concern ourselves with the management of thread states and the synchronisation and cleanup of threads under termination. With GCD and technologies like it, this is all changing. These developer tools and libraries such as libdispatch encourage developers to think about writing good code, and letting a clever kernel do the rest.

GCD and technologies like it are implemented as a simple set of extensions to C. Initially the idea behind these super smart schedulers on steroids was to solve the challenges of multi processor computing without the brain strain, but it's also solving more generalised problems in as much as the scheduling of multiple chunks of work without causing other problems in the pipeline.

These library tricks and tools are ultimately what will drive forward efficient utilisation of multi core systems. Given the environment we now live in (one of time pressures, first to market competition and bottom line 'time is money' style scenarios), the point of contention is no longer with the software engineer because the OS is taking care of all of this underneath.

CPU to GPU movement

The use of 'processors other than CPU' will become more ubiquitous, more than just using a GPU to accelerate desktop effects and



GCD takes kernel level calls from appropriately included libraries in a developer's code, and does its best to multi-thread and multi-core enable 'generic' code. It does this through the use of block objects feeding a general dispatch queue, which then triggers events to take place based upon a set of rules. The magic is in the ability to pass whole blocks around a system (block objects) without worrying about thread timing or synchronisation, as this is dealt with through GCD intrinsic.

more than using a GPU as a high speed video encoder. With the advent of frameworks such as CUDA and OpenCL, there is a whole new world waiting to be tapped into. The next step forward in OS design and technology is when the discrete GPU-using applications become entirely seamless. There will come a point in time in the not too distant future when you won't be able to tell if your application is using the GPU to offload from a busy CPU, or even if they are

load sharing, simply because the backend frameworks are so pervasive.

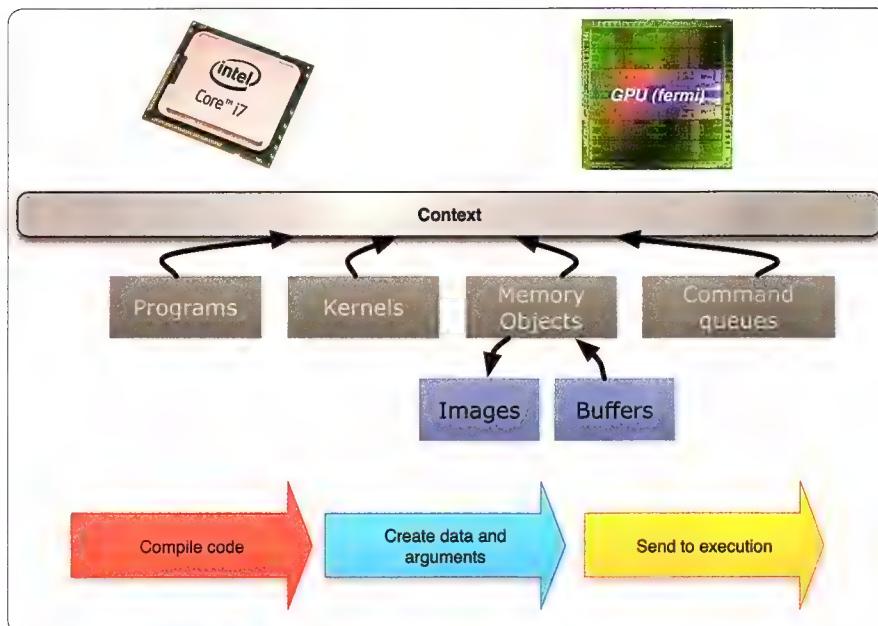
The intelligent step forward ceases to be about GPUs doing the things that CPUs can also do, and more about becoming a holistic 'whole processing' tool, using the power of all transistor-dense components working together like a symmetric multi-disciplinary powerhouse. From the vendor neutral perspective, everybody can benefit, but there are interoperability concerns, even if both CUDA and OpenCL approach the concept of 'all-transistor computing' from a different perspective.

The end game of using every processor in a system effectively is to get more done, with more hardware available to us. The effective use and management of this hardware at the software level is where true evolution is taking place.

Network scalability

In the not too distant future, you'll be really pushing that 10 Gigabit Ethernet at home. With the current and growing state of storage, we've now got hard disks that can sustain ~130MB/s streaming. Consider the types of disk subsystems we've mentioned earlier in this article, and you can burst 200, 300 or 400MB/s across the platters and out of DRAM/SSD cache without much effort as a result. This leaves a few things to be desired in terms of what kind of network I/O you've got available to you. With the ability to send packets from outside to inside, our I/O subsystems will, if left unchanged, be inevitably inadequate.

With greater I/O, comes greater CPU time to deal with the cycles. In more expensive NICs such as those found in server environments, TCP/IP Offload Engines (TOE) transfer the majority of the network stack work into the NIC



The power behind 'all processor computing' is in the ease of manipulation at the developer's hands. Here, we take an OpenCL example showing how the setup of this environment works for trivial everyday usage. First, we obtain the devices (the CPUs and GPUs available), then we create a common context for the two devices to work from, and finally we create command queues to be sent through this context as a similar means of communication between devices with entirely different low level logic.

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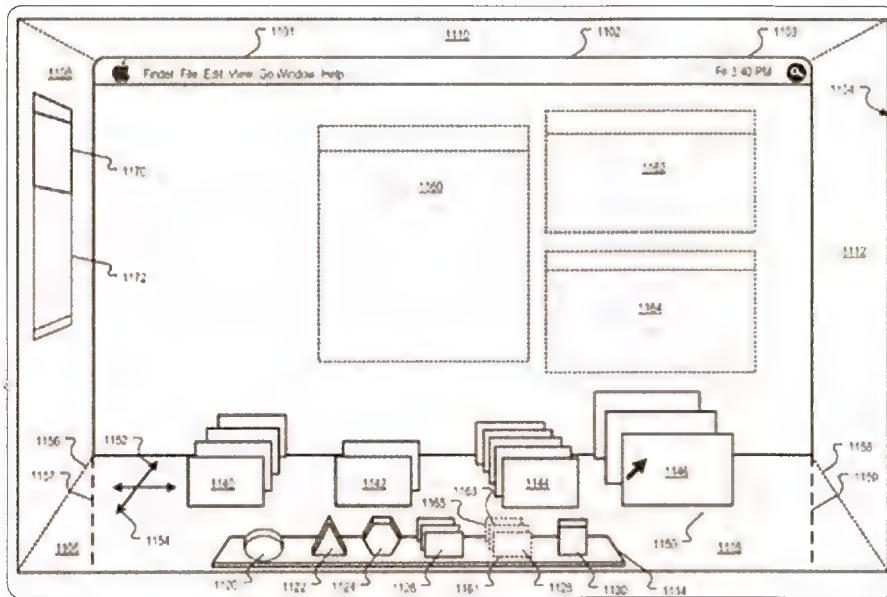
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Both Apple and Microsoft have demonstrated sketchy patent intentions for 3D interfaces, powered by next generation GPU + CPU style programming techniques.

silicon. Increasingly, as technology filters down to the consumer at consumer prices these TOE's will be removed. How do we stop CPU saturation without increasing the amount of expensive silicon?

Each time an interrupt request (IRQ) is generated from a network card passing something from the outside world to inside your system, some CPU time is eaten up. If enough of these IRQs can be generated the CPU will have no time to do anything but serve out these interrupts to the device that is asking for them (in our case, a big 10GigE NIC). Inbound packets don't get processed, applications that need CPU time have to wait, and your whole user experience ends up miserable. This is a state known as 'live lock', where a system is effectively functional and has not crashed, but is so busy it cannot process anything else.

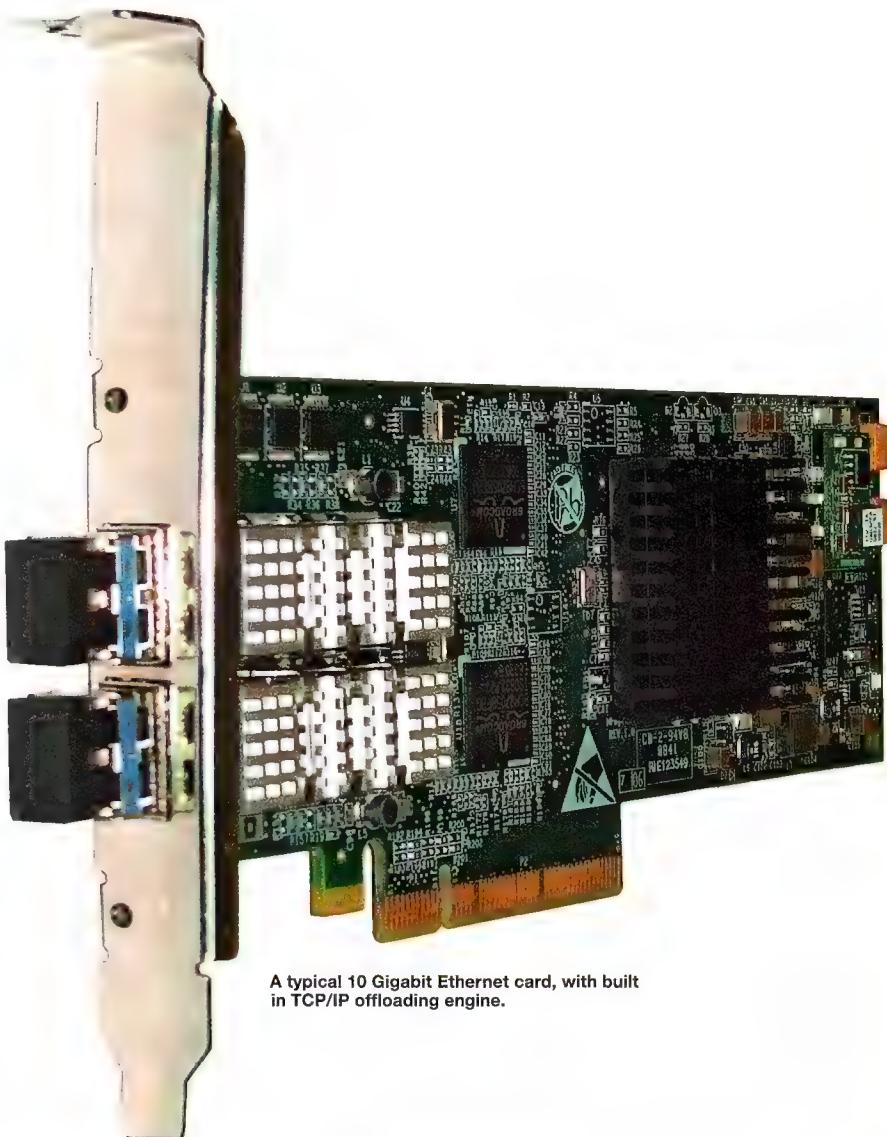
Next generation operating systems vendors are already thinking about this. TCP/IP offloading engines on silicon can do much, but still cannot cope with multiple 10Gbit/sec streams without having some significant impact on even the largest of servers. As a result, we rely on intelligent kernel and OS level transactions.

Microsoft, Apple, Sun, the *BSD crew and a host of other independent vendors are working towards making the network stack as we know it ready for the next generation of network I/O. They are doing this with a number of as yet unrealised techniques, such as:

- Device polling – the shadowy twin of IRQ technology, effectively allows us to periodically poll devices for packets and data held on large buffers, rather than using IRQs and saturating CPU time in queries. Polling reduces context switching inter-process, effectively reducing the risk of a live lock.

- Receive side scaling – a technology that makes use of the multi core world we have at our finger tips, effectively tying a single receive and send window of a network stream to a given CPU core (or maybe a GPU), giving other CPUs in a host system idle time, better used in other places.

There are some patterns to all of this. Our computing world is more than ever about multi-everything. It has far reaching implications across all the subjects we've touched this month, from storage to GPU performance and network I/O, but it also has a significant impact on the virtualisation market. Logical segmentation of small systems is possible in ways like never before. The future is definitely in hardware improvements and evolution, but the real intelligence and good use of our future operating systems comes from making better use of what we already have, and we are barely scratching the surface. We might just have to re-think how we use and build computers, starting today.  JC



INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.

I/O OF THE MONTH

Always consider chained 9V batteries

IThe stars must be out of alignment for me because in the last three weeks, I have purchased from overseas via eBay the following items:

1. Psion Teklogic Netbook
2. Novint Falcon haptic controller

...from different sellers, both of which have, coincidentally or by design, arrived WITHOUT a power adapter! So there is a bunch of very exciting bits and pieces just sitting there, which I am unable to use. Very frustrating!

I am left with the challenge of sourcing something which works. The Psion requires a 15.5v, 1.5a output power supply (Watts = V times A, so this is about 24 watts?)

The Novint Falcon power supply is "30 watts, 100V-240V, 50Hz-60Hz". There appear to be a wide variety of universal power supplies on sale at places like DealExtreme, such as their \$US25.50-delivered SKU 15249.

But that's a '100 watt' PSU. I am wondering, assuming the plugs fit, whether I could use this potentially with either or both of the above items, or whether I would end up with lumps of burning plastic.

Is it okay to use a PSU which outputs so many more watts than what each device is stated to require?

Larry Chen

OI wrote a thing about power-supply substitution a while ago: tinyurl.com/YDWDUF8. Sometimes it's easy, sometimes it's not.

One thing you don't need to worry about is a PSU with a higher power rating blowing up your equipment. This is not going to happen, for the same reason why the entire contents of the municipal water reservoir do not blast out of the kitchen tap when you turn it on.

If a power supply is of the old and simple unregulated 'linear' type then it will output more than its rated voltage if it's only lightly loaded, and that can kill devices. But all modern computer power supplies, and most plugpacks, are now of the lightweight

regulated switchmode type.

The Psion's numbers are in the laptop-PSU range, and yes, a universal laptop power supply like that cheap DealExtreme one will probably do, UNLESS the Netbook has some weird socket on the back rather than a normal barrel plug.

The Netbook's barrel plug – if it is one – seems rather small, but if it's too small for any of the plugs that come with the power supply, that problem's solvable. Just find a small plugpack that has the right size of plug, chop it off, and graft it onto the laptop-supply's output wire.

(All usual disclaimers apply about how people who don't know which end of the soldering iron gets hot should not make this their first electronics project.)

You'll also need to know the polarity of the plug. Barrel plugs are usually inside-positive, outside-negative, but you shouldn't stake the life of your gadget on this assumption. This information may be printed or embossed on the back of the Netbook; if not, try contacting one of the numerous Netbook nuts on the Internet, to be sure.

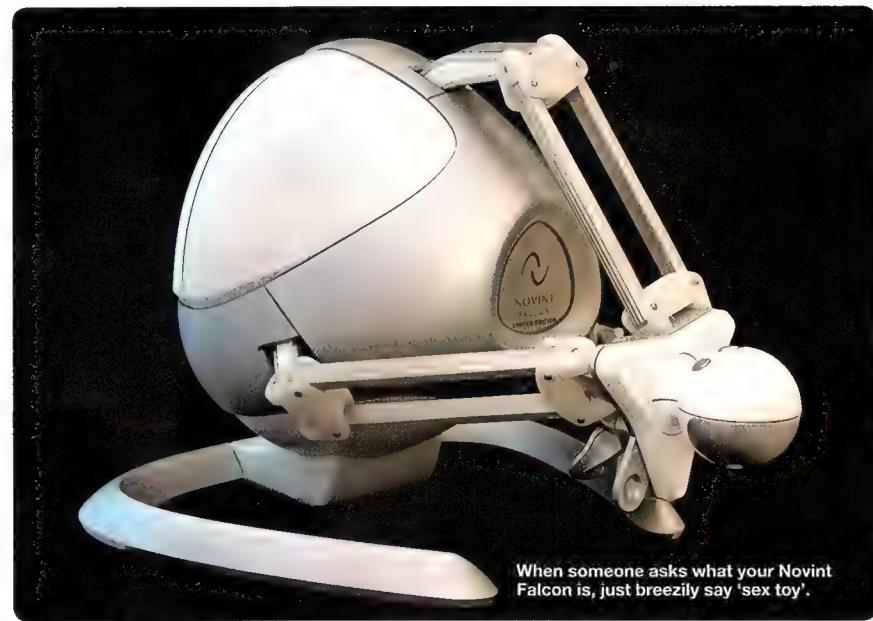
The wattage spec on the Novint site is not



very useful – it's just the overall maximum power consumption. The Falcon does come with some sort of plugpack, but without knowing what its specs are, you can't replace it.

If you're lucky, input power specs are on the back of the Falcon. If you're not, your best bet may be to just e-mail Novint and ask. I just checked out the manual and Quick Setup document from the Novint site; neither identifies the plugpack.

Again, a one-size-fits-many laptop PSU or appropriately-specced wall-wart will probably be fine, but plugging stuff in blindly is a bad idea.



When someone asks what your Novint Falcon is, just breezily say 'sex toy'.

It is... the FORBIDDEN cable!

I I'm sitting here at work, looking at a USB cable.

On one end of the cable is a USB A plug, the standard oblong one that plugs into computers and hubs.

On the other end of the cable is ANOTHER A plug, exactly the same.

I don't know where my work got this cable from. What is it for? Does it break the USB rules?

S. Thao

O It may violate the USB spec, or may not.

The only plain, 'dumb' cables with USB A or (full-sized) B connectors on them that are meant to exist are A-male-to-B-male, for connecting computers to external devices, and A-male-to-A-female, an extension cord.

And yet it is the work of ten seconds to find umpteen people selling A-male-to-A-male cables. And even little male-to-male plug adapters for male-to-female cables!

If your cable has a lump in the middle or one plug larger than the other, then it probably contains a 'USB bridge'. That connects two computers to each other in a two-node network, for file-transfer or Internet sharing or games or whatever. If both computers have Ethernet ports then you could just use a crossover network cable, but the USB bridge cable still has a reason to exist.

(Note that FireWire is meant to do this. All you need to connect two FireWire-equipped computers together is an ordinary FireWire cable.)

An A-male-to-A-male cable without bridge hardware, on the other hand, is forbidden. Connect two PCs with it and the best thing that can happen is nothing. The worst thing involves flames.

Apparently, these cables exist because some very slow learners in the lower end of the peripherals market made some USB devices with A sockets on 'em. Maybe they had a surplus of A sockets. Who knows. But the result was the aberrant creation you hold in your hands.

Ping may suffer if you use your neighbour's network

I I was looking at gaming systems on a PC store site, and wondered if you can get ones that have network cards to let me connect to a wireless network?

Christopher Makomaski

O You're not likely to find any normal PCs with a Wi-Fi adapter, but it's not hard to add one.

Most motherboards these days have integrated Ethernet controllers – quite often two of them, at least one of which will be Gigabit-Ethernet-capable.

I don't think any normal PC motherboards come with wireless adapters, though. Some little small-form-factor boards come with an integrated wireless adapter because they're difficult to expand, and likely to be used in places like living rooms and reception desks that don't have Ethernet cabling.



It's easy to add a wireless adapter to a normal PC. If you don't want anything dangling you can get a PCI or even PCIe adapter, but if that doesn't matter you can save a bit of money by getting a USB one instead. For gaming, it's possible that the USB one will add a little to your ping times compared with PCI or PCIe, but in reality the ping difference – even the ping difference between USB Wi-Fi and cabled Ethernet – is unlikely to be noticeable. Modern, 802.11g-or-faster wireless is only bad for gaming if you're getting a lousy signal.

Hey, if Dells are good enough for Stargate Command...

I I have a Dell XPS 420, Intel Core 2 Quad Q6600, with 4x1Gb dual channel 800MHz DDR2 memory. The Nvidia GeForce 8800 GTX 768 PCIe it came with is broken. I think I will replace it with a 1Gb Galaxy GeForce 9800GT. What do you think?

Nigel Walden

O Yes, that card should work fine. So would a number of other options, though.

I'm leery about installing new and exciting video cards in older brand-name computers, but that's mainly because the power supply can't necessarily deliver enough juice, and in a brand-name computer the PSU can be difficult and/or impractically expensive to replace.

Dell used to be terrible in this respect, using special PSUs with the same connector as a normal ATX PSU but different pinouts, so anybody who 'upgraded' to an ATX PSU would barbecue their motherboard. They're much better now, though; the XPS 420 has a BTX-form-factor motherboard, but like other standard BTX systems, it has a normal ATX PSU.

If the computer originally had an 8800 GTX in it, though, it'll be okay with lots of current graphics cards. A single 8800 GTX peaks at a draw of around 130 watts; the 9800 GT you're considering tops out under 120. A GeForce GTX 280 peaks at almost 180 watts, but the rather-better-value GTX 260 only draws a hair more than your 8800 did. A Radeon HD 4870 wouldn't draw significantly more than your 8800, either.

The new 58x0 Radeons draw rather more than any 8800, though; almost 190 watts peak, for the 5870. Those cost a lot more than the card you're considering, though, as do the only other big power-budget-breakers, SLI/Crossfire setups and the odd two-GPUs-on-one-board cards.

Also consider the GeForce GTS 250, which is a rebadged 9800 GTX. Early 250s were a pure rebrand job, later versions use a bit less power, but aren't any faster. The same goes for the GTS 240; that's a rebadged, lower-power-consumption 9800 GT.

And now, the List of Ways This Could Backfire.

If you're running a 32-bit version of Windows, a graphics card with more memory will create a bigger 'hole' in the memory map, which will reduce your accessible system RAM. If you're running 64-bit Windows, the difference should be negligible.

If there's nothing wrong with the old graphics card, because the problem is actually with the slot or motherboard or PSU or something else, then obviously swapping the card won't help.

If the old card really is dead, but was not the agent of its own demise, then swapping in a new card could just kill that one too. It is possible, though not likely, for a motherboard fault to connect a high-current PSU rail to ground through the graphics card, or do something similarly horrendous. 



The kids today don't even remember when all Dells were beige, and full of horrible non-standard components...



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Ashton Mills draws a line in the digital sand.

We love Steam, right? Oh, at first we thought it sucked, and to say it had teething problems is an understatement underwritten by King Obvious. But it got better and, as it did, the dawning of a new way of buying and playing games really started to sink in – you could download full games, right to your desktop, without leaving your seat! Hoorah!

The age of digital distribution was here. And it was woolly warm and fuzzy.

Bu then, slowly, it started to reveal the wolf underneath. Region restricted releases? EA and

the brick-and-mortar channel. Unfortunately for Valve, this rips out from under its feet the very purpose of a digital distribution system. It neuters Steam, nullifies its greatest asset. What's the point of digital distribution that is: a) not cheaper, b) not earlier and c) provides less than the boxed version?

And, finally, results in alienated customers – the people who actually *buy* the games. Now you can say that all of these issues are the publisher's fault, not Valve. Yeah... no. Valve is in every position to set how products are

price – it is afterall, *the same product* no matter where it's downloaded in the world, on an internet where there are no delayed regions for electrons that circle the globe *in an instant*.

Steam isn't the only digital distribution service out there (Stardock's Impulse is great, too), so don't forget you can shop around for your digital delivery needs. It's just disappointing that Steam didn't turn out to be the pioneer Valve touted it to be. A pretender to the throne perhaps, a faux pas of what digital delivery is supposed to be, but not the real deal.

At least not yet.

Ashton is absolutely the real deal.
amills@atomicmpc.com.au

We're not talking timezones here, but solid and different release dates, the type of which Borderlands recently brought to the fore.

Ubisoft come to mind. There are no regions, no borders, on the internet. That's the whole *point* of the internet.

And then, price discrepancies. Americans pay one price for a game, Europeans and Australians another? Just to be clear: same code? Check. Same download? Check. So the same game? Check. Same price? Er, no. Please bend over while we pilfer your wallet for no reason – none whatsoever at all – other than you're logging on from a different IP address.

Which is why I didn't buy Call of Duty 4.

And then release delays where the same game is released at different times around the world. We're not talking timezones here, but solid and different release dates, the type of which Borderlands recently brought to the fore.

The consensus with games like Call of Duty 4, Borderlands, and others is that dates and pricing are set to match local retail sales, ostensibly to prevent cannibalising

distributed over its service. It has the muscle to set the terms. Instead, it pays homepage to dinosaur publishers who are trying to play both sides of the coin. And the losers are you and I, the consumers.

Whatever pressures you may be under, Valve, it's time to swing favour towards the consumers. So, to help out I've written a quick cheat-sheet. Let's practice this a moment:

2K Games: "Gabe! We want to distribute Bioshockfest3000 through Steam when it's finished! But you must delay it and price it so that it doesn't come out any sooner, or any cheaper than the retail version!"

Gabe: "No."

There you go. Just say no. And then you can be nice and say you'll carry it, as long as everyone gets it at the same time, for the same





The man-machine interface

The ways in which we interact with technology are seemingly in a state of rebellion. **Ben Hardwidge** investigates.



Nintendo's Wii has now become such a ubiquitous lounge accessory that the only people you hear telling 'Wii' jokes either live in undiscovered rainforests, or have a worse comedic craft than Tim Ferguson. The idea of experimenting with new, immersive control systems appears to have captured the public's attention, and with innovations such as multi-touch taking over the design of phones and gadgets, the way in which we interact with technology is evolving at

a frightening pace.

After all, the Wii's original codename was Revolution, suggesting that the console would pull down everything we were used to, set fire to it, piss on the ashes, and stomp out a new way of thinking that would fundamentally transform our lives. Likewise, Konami wasn't afraid of trying out the R word with Dance Dance Revolution. Likening a game controller to the process of radically overhauling a political or social constitution may seem naively bold, but some methods of control are so firmly embedded in

our culture that we'd need a seriously dramatic revolution to send them packing. The fundamental way in which we type letters on a keyboard hasn't changed since Victorian times, and even the humble mouse has been doing the rounds since Douglas Engelbart's first demo in the late 1960s. However, now that so many new control systems are appearing, we decided to take a closer look at the way in which we control computers. Are we really undergoing a controller revolution, or is this just a gimmicky fad?

Why QWERTY?

As anyone with an interest in computer history will know, the established QWERTY layout was originally patented by Christopher Sholes back in 1874, and Remington quickly snapped it up for its typewriters. At this point, a new keyboard layout was needed to prevent the type bars from jamming, which was a common occurrence on alphabetically laid-out keyboards.

The QWERTY layout solved this, as the position of the keys meant that most words required input from both the left- and right-hand side of the typewriter, often with alternate keystrokes, thus limiting the threat of multiple bars coming from the same side becoming stuck.

Interestingly, if you take a good look at the QWERTY layout, you can also see familiar patterns from the alphabet. The letters D to L on the second row, for instance, are in alphabetical order, if you exclude the vowels. This basic keyboard layout has remained much the same, with only a few minor changes since 1874, even though no one has to worry about type bars jamming any more. Why are we still using it?

"I think it's because it's just been adopted by everybody as being the way to type," says keyboard manufacturer and technical support engineer, Robin Bithrey. "For somebody typing in English, the keys certainly seem to be in the right positions, with the more obscure keys pushed out to the edges – the Z and the Q in particular. It just seems to be the right way of doing things."

Many would disagree though. There have been a few attempts to oust QWERTY as the default keyboard layout, and replace it with a design that's quicker and more logical to use. One contender was George C Blickensderfer's design in 1893, which placed the most commonly-used letters (D,H,I,A,T,E,N,S,O,R)

on the bottom row. Perhaps the most famous alternative layout, however, is the Dvorak layout, which can still be used on computers today.

Patented by August Dvorak in 1936, the Dvorak layout proposed a new way of typing based on the way that humans typically work, as opposed to the needs of mechanical typewriters. Unlike the Blickensderfer layout, it placed the most commonly used letters on the second row, referred to as the 'home row', as this was where a person's fingers typically rested. All the vowels are on the second row, while the sparsely used Q and Z keys are placed on either side of the third row.

The layout was also designed on the principle that people should type from the edge of the

that we had to make them because we had orders for the darn things."

Basically, the demand for the Klingon keyboard is greater than that of Dvorak keyboards. "We did try one [Dvorak keyboard] once," says Bithrey, "but it never reached the production phase. If we got enough call for them, we'd build them – it's not a problem – but we only get one or two enquiries about them in a year."

However, Bithrey points out that this could well be due to the fact that so many generations have become accustomed to the QWERTY layout. "As someone who's getting on a little bit," says Bithrey, "I was taught to type on a very large, clunky typewriter with a clunky

"I think what people want is a reliable 105-key keyboard that's comfortable to use for many hours a day."

Keyboard inwards, as it's apparently easier to switch from your little finger to your index finger than vice versa. Despite all this, however, the antiquated QWERTY layout remains king, even though producing a Dvorak keyboard isn't particularly hard work. After all, it's just a different way of positioning letters on the keyboard.

As a case in point, manufacturer Cherry recently demonstrated the ease with which it could change keyboard languages and layouts by announcing that it could make a Klingon keyboard. "A colleague and I just came up with the idea one day after we were sending out some mail shots, promoting the fact that we can make pretty much any language of keyboard that you like," says Bithrey. "So we just released the Klingon one as a press release, and it went kind of ballistic. So ballistic, in fact,

layout at school, so it's just stemmed from then. My mother also learned to type on a big old clunky QWERTY typewriter, so it just goes back and back in history."

This is perhaps the biggest reason why QWERTY remains in charge. Dvorak may well be a superior design in terms of usability, but proving this would require a sample of people who had never typed with either layout learning to type from scratch. Not only that, but introducing Dvorak now would require many generations of typists to be retrained and the question would be if it was really worth the effort.

While researching this feature, I worked with a Dvorak keyboard for a few days and found it incredibly difficult to use – rather like trying to memorise the alphabet in a completely different order. This is undoubtedly because I've used a QWERTY keyboard for decades, rather than a fault with the Dvorak layout, but the QWERTY's historical legacy is so massive that changing over to a new keyboard layout would be insane. QWERTY may not be completely perfect, but many QWERTY typists can type much quicker than they can write, so the layout certainly appears to be doing its job well enough.

Even attempts to add new buttons to the standard 105-key PC keyboard have rarely caught on. With the notable exception of Windows key in 1995, other new keys haven't become standardised. This doesn't prevent keyboard manufacturers from trying to add new keys, though, which Bithrey describes as one of the biggest changes in the keyboard industry in the last decade.

You probably have several keys at the top of your keyboard for changing the volume, opening your email client and so on, but do most people use them? "In my opinion, I don't think they do," says Bithrey. "I think what people want is a reliable 105-key keyboard that's comfortable to use for many hours a



day. These extra keys are really there for show more than anything else. Certainly during a normal working day, I don't use them at all, and I think most people are exactly the same."

Don't forget to write

Perhaps the biggest potential change that could hit the keyboard industry isn't adding new buttons, but taking them away completely. Various touch-screen-based alternatives to the keyboard and mouse have cropped up over the last couple of decades. In fact, HP introduced its first touch-screen PC – the 150 – as far back as 1983, and has been widely experimenting with touch-screen technology ever since.

One of the biggest supporters of handwriting recognition is, of course, Microsoft. In 2002, the company launched its Tablet PC version of Windows XP. Surrounded by a veritable conference hall of hype, Tablet PC promised to change the way in which people worked with computers, providing state-of-the-art handwriting recognition technology, as well as virtual ink for interacting with documents.

Fast forward seven years, however, and Tablet PC is only used by a select few individuals. Why are most people still sticking with the keyboard and mouse? Cherry's Robin Bithrey reckons that this is "because of the technology more than anything else. Handwriting recognition is okay but it doesn't always recognise it properly – you have to go back and spell-check your work to make sure that you haven't put down something stupid and created a garbled mess rather than something that's readable. At that point, it doesn't actually become a time-saving device; it just takes more time".

One of the big Tablet PC launch partners was HP, so we also put the question to HP's consumer business development manager, Ben Perrins. "Tablet PC was much hyped and greatly anticipated," admits Perrins, "but it definitely has a place. I have colleagues that hold their laptop as if it were a clipboard, and companies such as HP and Microsoft will always try to have a product where there's a market to support it."

Although there are people using Tablet PC as their control system of choice, Perrins admits that the whole shebang had limited appeal. "Certain elements of Tablet PC took off," says Perrins, "but not the whole package. Having the screen fold down flat onto the base of the laptop, and holding the stylus for writing and dragging and so on – that's something that only a portion of the available market wanted to do."

However, Perrins states that in many ways



Both the iPhone and the forthcoming Palm Pre use capacitive touch-screen technology.

Tablet PC and its surrounding hype opened the door for people thinking about new control systems. "Tablet PC paved the way for seeing that there's more to life than a keyboard, mouse and touchpad," says Perrins. "Yes, there had been touch-screens and stylus before Tablet PC in a variety of formats, but the hype started people thinking about different ways to control and interact with computers. Tablet has its place, and it's spawned a few other ideas and behaviours that will go on to be much bigger."

Touch and go

One of those behaviours is interacting with a PC via the screen, and one of the major new touch-screen technologies creating a buzz now is multi-touch. This gives a screen the ability to sense multiple fingers at the same time, while also giving you a virtual on-screen keyboard for typing in text.

Multi-touch is already big news, thanks to Apple's use of the technology in the iPhone, and two-finger multi-touch will also be a feature of Windows 7. There are many ways of creating a multi-touch screen, but the two increasingly common methods use either capacitive technology or infrared sensors, while most standard touch-screens are based on resistive technology.

Capacitive technology is the basis of the technology in Apple's iPhone and the Palm Pre, and it works by sensing the weak electrical field that surrounds the human body. A continuous current flows across a conductive screen, so any additional current – such as that which comes from a finger – will cause the voltage to drop. The voltage drop will vary according to the finger's distance from the screen's four corners, which enables the finger's location to be recorded.

Infrared touch-screens simply feature a number of infrared transmitters on the X and

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Y axis of the screen, with receivers sitting opposite them. When you place your finger on the screen, it blocks certain infrared beams, enabling the computer to pinpoint your finger's location. This is a more expensive method than a capacitive screen, but it also has its advantages. For a start, infrared touch-screens have a naturally digital output, as opposed to the analogue nature of capacitive screens. Secondly, you can theoretically turn any display into a multi-touch screen by placing an infrared frame over the top of it.

Part of the problem with multi-touch at the moment, however, is that there's no standardised way of implementing it. As well as having multiple different hardware technologies, there's also no standard when it comes to software. At the moment, this is causing a few headaches for developers of smartphone software. As an example, we spoke to David Halpin, VP of engineering at Quick Office, whose office suite runs on a variety of smartphones, including the iPhone, and Blackberry, Android and Symbian devices.

According to Halpin, the ease with which you can currently implement multi-touch features depends on the system for which you're coding. "Multi-touch is very well implemented on the iPhone," says Halpin. "It has great development tools and simulators, and good documentation. It's very easy to build iPhone software with multi-touch, since the device came with multi-touch by default, so there was never an iPhone device that didn't have it."

"The system basically sends you the location of each of the fingers and what's going on with those fingers, so you can track certain fingers over time and their position. It can also

send you higher-level information, such as whether the user swiped their finger across the device, and you can respond to it on that level, so programming for the iPhone isn't very difficult at all."

However, Halpin says that coding for other multi-touch smartphones is often much more complicated. "Google doesn't support multi-touch out of the box on Android," he says, "so there are a lot of custom systems that vendors are producing to try to add multi-touch to their devices, but it works differently depending on the device for which you're trying to code. That's a pain because there isn't a standard yet – it hasn't been properly pulled, or at least not publicly pulled, into the Google platform."

The same also applies to Symbian, which Halpin says was "basically retro-fitted with what it had in the past". According to Halpin, "it was a reaction to the iPhone; Symbian tried to add that functionality very quickly, and released it maybe a little before it was fully baked".

As well as getting to grips with the myriad different operating systems and hardware, software developers also have to think slightly differently about the way in which people use software, especially when devices such as the iPhone don't even have a physical keyboard.

"When going to a touch UI you have to think a little differently," says Halpin. "The usual pop-up menus where you scroll through selections don't really work well with a finger, since you need something you can physically touch with your finger, so the menu has to be resized and the screen layout has to be bigger, as you're using a fat finger as opposed to a small cursor. Also, with a cursor that you can move up and down with an arrow

key,



you can hover over menu items and then press a different button to make your selection. With a touch-screen, the user tends to bring up a list, and instead of dragging their finger up and down the list, they usually let their finger go, and then touch what they want."

Although it's still in its infancy, multi-touch is a huge part of the iPhone's appeal, and it enables an interface that's more intuitive than a standard point-and-click design. Halpin gives the example of using a pinch gesture on the iPhone, where you place your fingers in the centre and pull them apart to zoom in or pinch them together to zoom out. "You could have a menu that pops up and says increase or decrease zoom, or you could dedicate some hardware keys on the keyboard, where they push the plus and minus keys to zoom in and out," says Halpin, "but it isn't as interactive."

As well as the feeling of instant interaction, multi-touch is also instinctively easy to learn. You don't need to learn the positions of various keys or how to use a mouse, you just touch the screen and learn a few gestures – it's about as natural as a computer interface could

be. "Think of your desk," says Halpin. "You don't say, I want to move that

pad of paper from the left-hand corner of my desk to the right-hand corner. You don't enter a command on your keyboard or pull up a menu and say 'start drag' and then hit the arrow keys on your keyboard to move it. You reach over, place your fingers on the pad, apply a little pressure down and drag your arm from left to right with the pad."

HP's Ben Perrins concurs, and also cites the example of HP's



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TouchSmart interface for its multi-touch, all-in-one desktop PCs as a way of interacting with your music collection. "You have all your CDs as pictures on the screen," says Perrins, "which isn't revolutionary, but you have them all fanned out on the screen and it looks fantastic on a 25.5in screen. You just scroll across with your finger, fan through your CD collection, tap the CD you want and hit Play."

As Perrins points out, while this doesn't appear to be a huge step in terms of technology, it's a big step in terms of getting people to use computers naturally. "I know it's a cliché to say this," says Perrins, "but whether you're aged four or 84, you can relate to that – it's a picture of your albums, you can move them with your finger and press the one that you want to play. You don't have to explain PCs, Windows or keyboards and mice to anybody if they can interact with it in that way."

Gaming

Touch-screens and multi-touch are also starting to have an impact on games. Although you could play many games on touch-screen PDAs, the first big success was the touch-screen on the Nintendo DS. This gave the device a mouse-like pointer device that enabled interaction with the console beyond the standard D-pad and buttons. As well as making the console better at handling FPS games, such as Metroid Prime: Hunters, and turn-based strategy games, such as Advance Wars, it also provided a new method of pen-based control, which was great for quirky titles such as WarioWare: Touched.

The other main device that's pushed this further is the iPhone, which now has an expansive collection of games that rely on multi-touch gestures to play games. For example, in Team17's iPhone version of Worms, you can tap the worm to jump, and double-tap him to do a back flip. The iPhone games catalogue now features everything from simple puzzle and board games to versions of Civilization Revolution, as well as a forthcoming version of Duke Nukem 3D.

This all makes sense on portable devices, but could we also see multi-touch gaming making it to the desktop PC? It's certainly a possibility. Last year, PQ Labs demonstrated a multi-touch version of Warcraft III on its iTable multi-touch system.

With PQ Labs' infrared multi-touch technology in place, the game doesn't only distinguish between different points in the

screen, but also recognises the difference between a fist and a finger. As such, if you hit an enemy with your fist then it means attack, while a finger can be used for selection tasks. Meanwhile, you can also use your hands to zoom in and out, and change the field of view. It's well worth looking at the video of this in action on <http://multi-touch-screen.net>, as it shows how quickly and easily the game can be manipulated once you've got to grips with multi-touch.

According to PQ Labs, the addition of multi-touch means that "you can physically interact with the virtual world without menus or commands. The interface just disappears". We caught up with PQ Labs' Yang Qi to find out how you go about remaking a game for multi-

touch, which in the case of Warcraft III, turned out to be a simple case of remapping the keys.

"It's very simple," says Qi. "With Warcraft, you can use keyboard shortcuts to control the program, so our monitor just mapped to the keyboard. We can basically do everything that a keyboard and mouse can do." Qi describes PQ Labs' multi-touch system as a 'multi-mouse', and the company's software also enables full five-finger multi-touch. In the case of gaming, Qi points out that this means you could control five different soldiers, each with a different finger.

Controlling an RPG with multi-touch is one thing, but could you also use it for first-person shooters on a desktop PC? "We tried some," says Qi, and adds that there's a similar concept in the company's Aztec demo, which enables you to walk around a virtual house using multi-touch. However, Qi says that, at the moment, fast-paced first-person shooters are too much for multi-touch. "Counter-Strike is just too fast," says Qi. "You really need a reaction time that's quicker than 10ms [the quoted latency of PQ Labs' multi-touch technology]."

It isn't only a question of responsiveness, though, but also of having the appropriate controller for the job. You could theoretically control a first-person shooter using multi-touch, but there would be no need unless it did a significantly better job than your keyboard and mouse. However, for other types of game, multi-touch makes much more sense.

HP's Ben Perrins gives the



Sony's Eye Toy set the stage for full-immersion gaming, with its camera system picking up your movements and putting them into the game.

example of puzzle games, in which you can imagine manipulating a tile puzzle on the screen with your fingers. Could multi-touch transform PC gaming? "I don't think it will become the predominant way of interacting," says Perrins. "I can imagine multi-touch being the primary interface for gaming in its most basic form for children, but then it falls away as games and users become more sophisticated. At the top end, I can also see people occasionally using touch and multi-touch on sophisticated MMORPGs though."

Of course, the major changes in game controllers have mainly appeared in the console gaming business rather than on the PC. Quirky alternative game controllers have been around for decades, starting with basic light guns and add-ons such as the Nintendoscope bazooka, but the past few years have seen a definite shift towards changing the way in which we interact with video games.

SEGA was one of the biggest early innovators of this. Bass Fishing for the Dreamcast, for example, enabled you to dabble in virtual angling from your lounge with its fishing rod controller, making it feel like you were fishing without getting soaked or killing any fish. Meanwhile, Samba de Amigo enabled you to strut your stuff and shake a pair of maraca controllers in time with the music.

The game that's done the most to popularise this development, though, is Guitar Hero, with its guitar-shaped controller. Its success has paved the way for a huge number of games, from Tony Hawk: Ride to WiiFit, and the Wiimote itself. Using a combination of an infrared sensor with a Bluetooth gyroscope sensor, the Wiimote gives you a full six degrees of motion, meaning that you can use it as anything from a tennis racquet to a steering wheel, while also gaining a pointing device. So versatile is the Wiimote, in fact, that versions of SEGA Bass Fishing, Samba de Amigo and Donkey Kong: Jungle Beat have all been rereleased for the Wiimote without the need for another controller.

One area in which the Wii is lacking, though, is the ability to see what you're doing, as



opposed to merely sensing it. This is an area that Sony played around with when it released the EyeToy camera system for the PlayStation 2, enabling the camera to record what you were doing and incorporate your movements in a game. The device even enabled you to play an EyeToy-equipped version of Lemmings, as well as plenty of party games. It might not have changed the face of gaming, but it was the start of something new.

Last year, an independent development team called CamSpace (www.camspace.com) also developed its own way of interacting with a PC's webcam and using it as a controller. By placing the correct shape of coloured pads on an object, CamSpace's software enables you

According to Microsoft, Project Natal can not only track the movements of your body, but also detect facial expressions and gestures. Plus, it also has voice recognition. As with the Wiimote, the idea is that you can completely immerse yourself in a game without being confined to the sofa with a gamepad.

Post-natal care

With ideas such as Project Natal effectively removing the idea of a controller altogether, it's debatable whether in the long-term, interaction with technology will involve 'controllers' at all. Both Ben Perrins and David Halpin predict that in the long term, the barrier between us and our machines won't be so obvious, and that the

of you as you're walking, a picture of a screen superimposed in your vision a foot or two away from your face."

Will this mean the end of the control systems we know today though? If it does, it won't be for a long time. Microsoft stresses that "Project Natal is meant to enhance, not replace, the experiences on Xbox 360". The new control system will suit some games that are specifically tailored to it, but other games will play much more efficiently on a traditional gamepad. Even the Wiimote also requires the addition of the analogue joystick on the Nunchuk controller for many games, while Nintendo also makes a classic gamepad controller available for playing some of the Virtual Console games.

The future of controllers is likely to have a rich and diverse range of options to suit different tasks, rather than replacing what we already have. This doesn't necessarily mean that we're going to have houses full of different controllers though – the Wiimote has already shown that it can replace several types of novelty controller in one device, and it isn't as though multi-touch requires any more space on your desk. What we're more likely to see in the short to medium term is a lot more choice.

"In order to replace a current controller such as the keyboard," says HP's Ben Perrins, "the new controller needs to be easier, faster, more efficient and more fun to use than what people were using before. In this respect, people are like electricity; they will take the path of least resistance."

Until a new controller can do everything that a mouse or keyboard can do, and do it better, we'll be using a wider choice of controllers that are better suited to different tasks. Multi-touch has obvious advantages when it comes to manipulating photos on screen, for example, but it isn't as well suited to typing out an article such as this one, which comprises thousands of words.

Virtual keyboards make sense on smartphones such as the iPhone and tablet PCs, and they also have their advantages. For example, you can easily change the language of a virtual keyboard, and fit in lots of characters on a small screen by quickly changing what 'keys' actually represent. However, you really can't beat the feel of a proper keyboard on your desk for serious typing. It's also worth noting that many people can now type a lot quicker than they can write, so even handwriting recognition isn't necessarily advantageous to everybody for every writing task, even if it worked flawlessly.

The ways in which we interact with technology are becoming more varied, immersive and in many ways better suited to specific tasks. In the future, we can not only look forward to being able to use multi-touch as standard, but also having a

keyboard and mouse on which to fall back when we need them. 

“Using a combination of an infrared sensor with a Bluetooth gyroscope sensor, the Wiimote gives you a full six degrees of motion.”

to use that object as a game controller that can be detected by your webcam. You could cut out a circular piece of cardboard and use it as a steering wheel, or you could attach pads to your fingers and play Solitaire with a virtual pinching motion to pick up the cards. It works surprisingly well, although you need a very responsive webcam and good lighting conditions for it to work quickly enough.

Perhaps the biggest announcement in this field, however, is Microsoft's Project Natal for the Xbox 360. Promising to do away with the notion of a controller at all, Natal features an RGB camera, depth sensor and multi-array microphone, as well as a load of custom hardware and software to determine precisely what you're doing in front of it.

Microsoft is keeping quiet about all the specifics at the moment, and wouldn't discuss Project Natal with us for this feature. However, the demos so far look very promising. In particular, Lionhead's Milo demo, in which Milo is a virtual child in a game, is pretty amazing. In the demo, a woman is showed talking to the child as if they are having a conversation, before moving up close to the screen and handing him a sheet of paper. Milo reaches out and picks up the paper, and it then appears on the screen. Although a fair amount of this demo appears to be pre-scripted, the Natal-equipped player's ability to interact with the woman at exactly the right times shows that it certainly has some solid capabilities.

idea of having a controller will seem archaic.

"I can genuinely envisage a time when the technology is so coupled to the human machine that you don't really talk about the connection anymore," says Perrins. "It will seem crude to have used your hand to use a mouse if you can think a cursor around the screen. I don't want to go too bonkers here, but you'd only have to have found a way to be able to fully connect to the visual cortex in the human machine, and then you could effectively project images from the computer as if you were seeing them."

How would this affect the way in which we control computers? "Imagine walking down the street now," says Perrins, "and you want to look at Outlook, so you take out whatever device you've got in your pocket or your bag, and you open it and look at it. I can genuinely see a time when, instead of doing this, you imagine that interface and it appears as if it's two metres in front of you in the street, and you can look up and down your schedule for the day, and something is putting that straight into your visual cortex."

Halpin agrees. "Longer-term, you're going to be into things such as direct retinal imaging, where the device is actually looking at your eye and noticing where you're looking, so it's tracking your eye movement relative to the different parts of the screen you're looking at. Maybe it will even project the image onto your retina, so you can look out in front



Microsoft's forthcoming Project Natal promises to remove the controller altogether by tracking your movements and recognising your voice.



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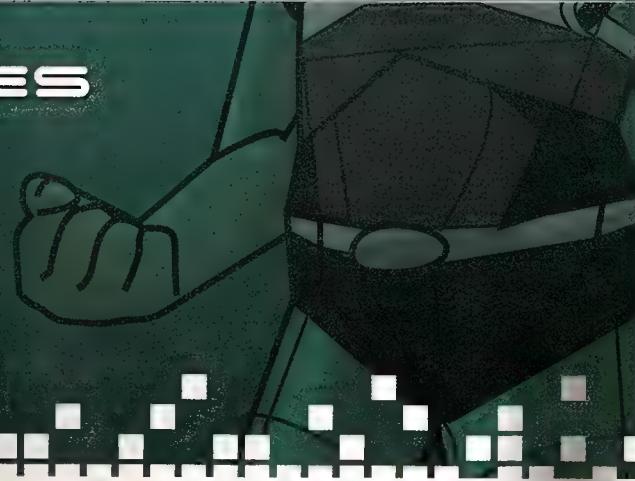
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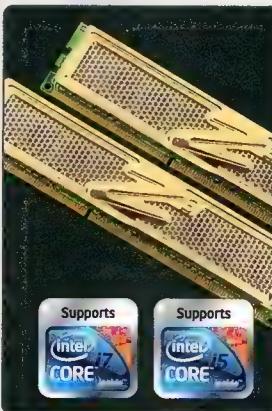
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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

With the launch of Windows 7, it's the best time to upgrade your PC's storage system, or to build an entirely new rig – and for that, you want an SSD. But which one to choose, and how best to look after it? We've done the hard yards for you, so if you're in the market for something small and sexy and fast, this month's Head2Head is for you.

We're also still sorting through new P55 releases; this month we look at the first mATX offering, a tiny powerhouse of a board. We get surprised by AMD's new processor, continue our love affair with ATI's new 5-series video cards, get wowed by Corsair's first PC case (and I mean... WOW!), and mess about with headphones from Sony and Creative.



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NVIDIA's Fermi: An architecture inspection

Justin Robinson pulls apart NVIDIA's upcoming architecture.

NVIDIA has long been a strong force in the graphics world, smashing the competition almost completely with its GPUs in 2007/8 and still providing a hearty challenge to this day. With revenues hitting over US\$1 billion dollars per quarter, the company has a research and development team to match – and they've been cooking up something set to please enthusiast tastebuds. Codenamed Fermi after the Italian Enrico Fermi, an important physicist who worked on the Manhattan Project, the sheer technical specs seem to be just as powerful as any nuke.

Development began back in November of 2006, as NVIDIA released its G80 core in the form of the 8800GTX. A revolutionary change at the time, this architecture boasted a complete rethinking of how graphical cores functioned, fusing the separate Vertex and Pixel pipelines into one cohesive collection of multipurpose processors and nabbing the performance crown. It boasted 128 general purpose 'Stream

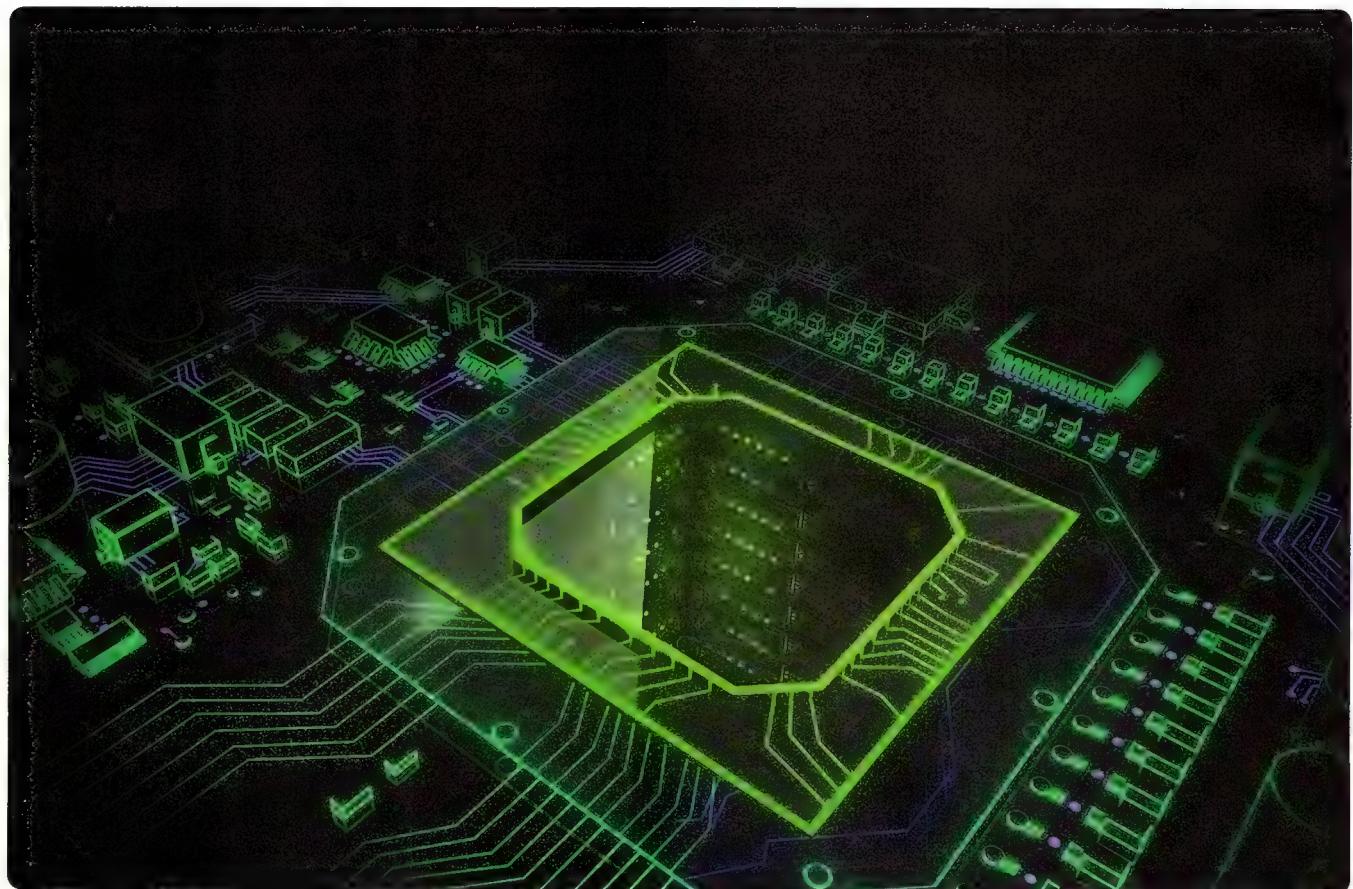
Processors', was manufactured on the then comparatively large 90nm process and totalled 681 million transistors in a die measuring 484mm². GDDR3 was the order of the day, packing 768MB of it on a 384-bit memory bus.

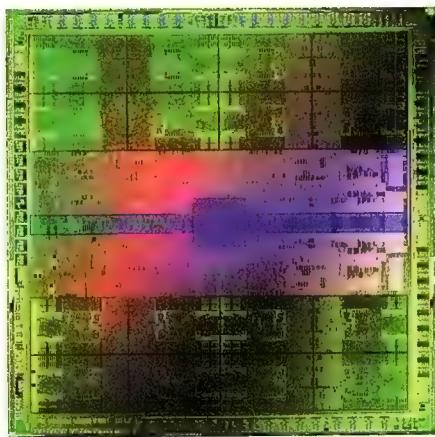
Development built upon this very successful core, bringing about the next generation in the form of the GT200 core. Evolutionary this time rather than revolutionary, it still utilised the same general purpose Stream Processors but boasted an enhanced complement of 240 of them. It is now manufactured on the 55nm process, holds a doubled transistor count to 1.4 billion and takes up a die size of 470mm². Still competitive against some of the main competition's offerings, this architecture is beginning to run out of steam – necessitating an upgrade that will come in the form of Fermi next year. Memory support remained as DDR3, though the memory bus was widened to 512-bit and capacity increased to 1GB.

Finagling Fermi

When NVIDIA introduced its CUDA instruction set and other GPGPU capabilities the GT200 architecture was found by users to be slightly limiting in specific cases. It didn't offer enough cache to work with, didn't have any error checking and many other architectural limitations that blocked some programs from running at all, while merely hindering others. Taking the design back to the drawing board, NVIDIA's engineers have reorganised and reworked the GT200 core to such an extent that it's practically an entirely new design, one that sports a zippy 40nm manufacturing process and an astronomically high transistor count of 3 billion. This is in part due to the heightened complement of 512 Stream Processors; though they have been newly dubbed CUDA Cores.

Memory bandwidth has been greatly upgraded to GDDR5 running on a 384-bit





memory bus, which will increase the throughput significantly. However every part of the core has been tweaked and the majority of the chip reworked, with major changes outlined thusly:

Streaming Multiprocessors

The full complement of 512 CUDA Cores makes appearance not individually, but instead grouped into sixteen large collective areas called Streaming Multiprocessors, or SMs. These sixteen SMs are located equally above and below the middle area of the die as pictured: eight identical green rectangles of 32 CUDA Cores each. A CUDA Core is broken down

and square roots that are not as easily worked upon by traditional means. Packing four of them in each SM gives a total of 64 SFUs, clearly aiming the architecture at multipurpose processing needs rather than being limited to graphical tasks.

Dual Warp Scheduler

While a Warp Scheduler might sound like something out of *Starcraft*, it is slightly less visually exciting but no less important than any other part of the architecture. Located within the SMs, the Warp Scheduler sits at the top of the hierarchy and dictates the workload for the entire core, something retained from the original G80 architecture but doubled in the case of Fermi. Each Warp Scheduler directs work to the CUDA Cores and since there are two of them within each SM, two different kinds of work can be performed concurrently – compared to the current design where Cores will be left idle until the first task is completed. This represents a huge potential performance increase, as less idle time means theoretically more utilisation of the processing grunt available.

Parallel Execution

One limitation of previous GPU designs was that while programs could be coded relatively easily in C or C++ with extensions, getting individual processing cores within the die to be able to work upon the same data was difficult. As each result was generated and randomly placed within free memory by the processor

memory addressing, though the card supports 64-bit in case more is ever needed.

Memory Support

Fermi has been upgraded with a large L2 cache residing in the middle strip of the core, packing in 768KB of cache per SM for a total of 12MB. This is the same amount that current Intel processors boast, and forms a direct relationship as a buffer between the 64KB of memory inside each SM and the GDDR5 memory located outside the core. The memory controllers that communicate with DRAM are located around the edges of the core in a large ring, giving a bus 384-bits wide and support for up to 6GB of memory, though this likely will remain around 1-2GB for retail boards. While no clockspeed information has been released, a guess of 1000MHz on a 384-bit memory bus gives a theoretical bandwidth higher than ATI's current high-end cards.

NVIDIA's Challenge

It's clear from the changes that NVIDIA has made to its architecture that the company is aiming directly towards the GPU computational scene, but the changes it applied are perfectly appropriate and important for gamers. Increasing the CUDA Cores by more than twice the current amount will net a significant performance increase, adding memory support for GDDR5 will increase bandwidth and rethinking the cache system will give more workspace for game coders to play with. However the road NVIDIA must travel is not perfectly flat, and its challenges will lie in competition from the decidedly gaming-oriented ATI products, which are not only available today, but will have been on the market for many months before Fermi reaches stores.

To take Fermi and spur enthusiasts into upgrading, it will have to offer either incredible performance or be competitive on value. The latter is not likely; 3 billion transistors do not add up to a small and therefore cheaper core, meaning that performance is going to have to be impressive. NVIDIA has the technical specs, the development team and the experience to be able to pull off this kind of move, but the alternative is conceding the gaming market to its only real competitor – rumoured to be made even more complex if Intel's Larrabee ever comes into play. Until Fermi is released sometime next year, we'll be watching and waiting with sheer anticipation. 

"To take Fermi and spur enthusiasts into upgrading, it will have to offer either incredible performance, or value."

even further into its own miniature ecosystem of processing cores, sporting both a Dispatch Port and Operand Collector that work together to recognise functions needed by the program and organise their calculation. Still within the Core, the work is passed onwards to the Floating Point or Integer unit depending on the type of calculation needed, and the result produced finally exits the Core to be passed onward to the cache for temporary storage or more calculation.

Within the SMs are also sixteen load/store units with an address width of 64-bit, double that of the GT200/G80. These allow programs to directly access 64KB of memory available within the SM, itself configurable to work as a hybrid Shared Memory space or an L1 Cache depending on application needs. The load/store units can also pull data directly from the GDDR5 memory on the card, though speed obviously suffers.

Also packed inside the SMs are four Special Function Units, a doubling over the GT200/G80 architectures. Their main purpose is to handle transcendental instructions; in other words functions like sin, cosine, reciprocal instructions

that generated it, there was no organisation to where to find the result available to the remaining processors. This has been solved by what NVIDIA has named PTX 2.0, essentially a filesystem within the cache that allows any program to be pre-compiled with the exact locations already determined. What this means is that true C++ programs can now be run relatively painlessly on the GPU, something that had been slightly tricky before. Also utilised is a 40-bit address space for a theoretical Terabyte of

Graphics core comparison

Graphics Core	G80	GT200	Fermi
Intro Date	November, 2006	January, 2009	2010
Transistors	681 million	1.4 billion	3.0 billion
Manufacturing Process	90nm	55nm	40nm
Stream Processors	128	240	512
Special Function Units	2	2	4
Shared Memory	16KB	16KB	48KB
Load/Store Address Width	32-bit	32-bit	64-bit

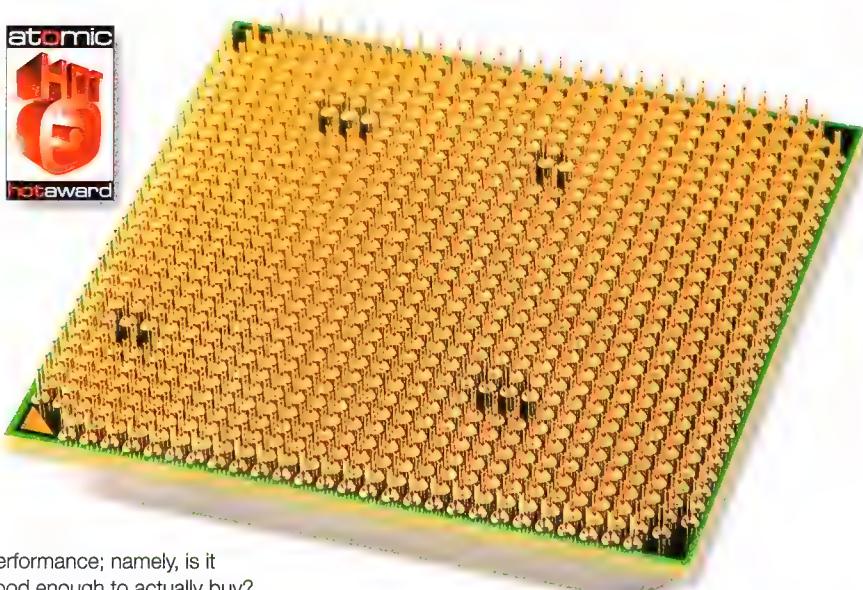
Athlon II X4 620

The best value Quadcore yet.

Street Price \$139 **Supplier** AMD

Website www.amd.com

Specifications 2.6GHz quad core; 45nm manufacturing process; 'Rana' core; 128KB L1, 2048KB L2; 13x multiplier; 95W TDP; AM3.



AMD has had a tough fight in the CPU world for some time now, dating back to the first Core 2 Duo chip released a few years ago. Its Phenom range offered decent performance, but Intel's competing quadcores were similar in price for a very significant performance advantage – further cemented by the launch of the Core i5/i7 ranges. AMD has lost the high-end performance scene, so it's done the only thing that makes sense: gone for the ultra-budget.

This CPU slots into its Athlon series of processors, unique for their low cost and stripped-down feature set. The X4 620 sports a stock clockspeed of 2.6GHz given by the locked 13x multiplier and a bus speed of 200MHz. It's packaged into the newer AM3 socket, giving capacity for DDR3 and DDR2 memory as well as backwards compatibility to AM2+. Thanks to the 'Rana' core running inside it, there's a dual 64kb data/instruction L1 cache per each of the four cores, coupled with 512kb of L2 cache per core. Being in the Athlon range means that there is no L3 cache here at all, unfortunately hindering performance in some calculation-intensive tasks.

Although the chip is missing a significant portion of power-hungry cache it still manages to tip the scales at a 95W TDP, the four processing cores pumping the heat output up. This was still pretty manageable however, and cooled by the Thermalright Ultra 120 eXtreme heatsink it never became overly hot. Coming in at an amazing price of just a shade over \$130 it is astounding value for any quadcore, but with cache stripped back and other hindrances the question boils down to

performance; namely, is it good enough to actually buy?

Stock performance at 2.6GHz shows that multithreaded apps run pretty well, netting essentially the same results as a Q8200 at 2.33GHz (online here www.atomicmpc.com.au/?129237). Singlethreaded performance isn't quite as high by a few seconds' difference, but thanks to the integrated memory controller inside the X4 620 the memory latency is significantly reduced. Already this seems like a great chip considering that the price is \$60 less than Intel's offering for essentially the same performance, but when overclocked this value rises even more.

Pumping up the HT bus to 275 and raising the vCore to 1.440V gave a final clockspeed of 3575MHz, a decent 37 per cent speed increase. At these levels we ran Cinebench multithreaded and got a score of 12988 – compared to the same Q8200 at 3.4GHz which scored 13985. The performance difference between these two architectures is pretty clear, netting Intel's chip an extra thousand points while running 175MHz slower – but again, the X4 620 is significantly

cheaper. Perhaps even more impressive is that the X4 620 is performance-competitive with AMD's own Phenom II X4 955 Black Edition, being only a few seconds slower at stock levels in most tests (but definitely losing out in overclocking capability).

This means that the chip is perhaps the only AMD processor on the market today that makes sense to build an entire new rig around; the value of it is high enough to justify staying away from LGA775, and the performance is more than enough for most tasks. If you've already got an AMD platform you'd be mad not to upgrade to this chip at the rock-bottom price it's placed at, and while the lifespan of the AM3 socket is not known for now it's a safe bet to say it'll be around for at least a few years yet. Until AMD release a new architecture (which they bloody well need to soon) this is its best chip yet.

Athlon II X4 620

	X4620 5-5-5-15	200x13; DDR2-800 5-5-5-15	217x13; DDR2-860 5-5-5-15	230x13; DDR2-920 5-5-5-15
PiFast	44.87s	41.75s	39.28s	
wPrime 32M – single thread	54.769s	50.733s	47.844s	
wPrime 32M – multi-thread	14.335s (1.98x efficiency)	13.275s (1.99x)	12.449s (1.95x)	
CineBench R10 64-bit – single thread	2780	3002	3199	
CineBench R10 64-bit – multi-thread	9733 (3.50x efficiency)	10409 (3.47x)	11067 (3.46x)	
Everest Read	7359MB/s	7717MB/s	8223MB/s	
Everest Write	6964MB/s	7525MB/s	7970MB/s	
Everest Latency	57.3ns	54.3ns	51.3ns	



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Supports



Supports



INTEL®P55

Intelligent performance

Support the Intel® Core™ i7 and Intel® Core™ i5 Processors in the LGA1156 Package



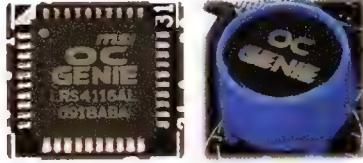
MAINBOARD P55-GD65

- Support Intel Core™ i7 & Core™ i5 Series Processor in LGA 1156 Package
- Support DDR3-2133(OC) Memory
- Support 2 VGA Slots

Key Features

OC Genie

OC Genie is the world first Auto OC Processor. With one click, OC Genie will automatically detect the optimal settings for your individual system.



SuperPipe

SuperPipe is the thickest 8mm heatpipe which provides 90% better cooling efficiency and 50°C (90°F) lower temperature.



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DrMOS is the world's fastest server class MOSFET. The best power component provides stable power supply and high overclocking ability.



Specifications



Processor

Support for an Intel Core™ i7 and Core™ i5 processor in a LGA 1156 socket

Memory

4 DIMMs support for DDR3-2133(OC) up to 16GB max

Video

- 2 x PCI Express x16 slots
- Support ATI CrossFireX & NVIDIA SLI Technology

Audio

8-channel (7.1) HD Audio subsystem with S/PDIF out

LAN

Dual 10/100/1000 Mbits/sec LAN subsystem

Peripheral interfaces

- 6 x SATA 3.0 Gbps ports from P55 with RAID support
- 1 x SATA 3.0 Gbps ports from JMB363 with H/W RAID support
- 1 x Power eSATA port
- 1 x PATA IDE port with ATA-66/100/133 support
- 2 x IEEE 1394 ports (1 external port, 1 internal header)
- 14 x USB 2.0 ports (8 external port, 6 internal)

Expansion capabilities

- 1 x PCI Express x4 slot
- 2 x PCI Express x1 slots
- 2 x PCI slots

THE PERFECT COMBINATION



ISGC-300 CLP0539

The ISGC series of coolers take advantage of the specially designed 120mm fan that minimizes noise and maximises overall airflow. It supports all current processors such as the Intel Core™ i7 and all AMD CPUs.



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ASUS Sabertooth 55i

Roaring performance or mewling mediocrity?

Street Price \$505 Supplier ASUS

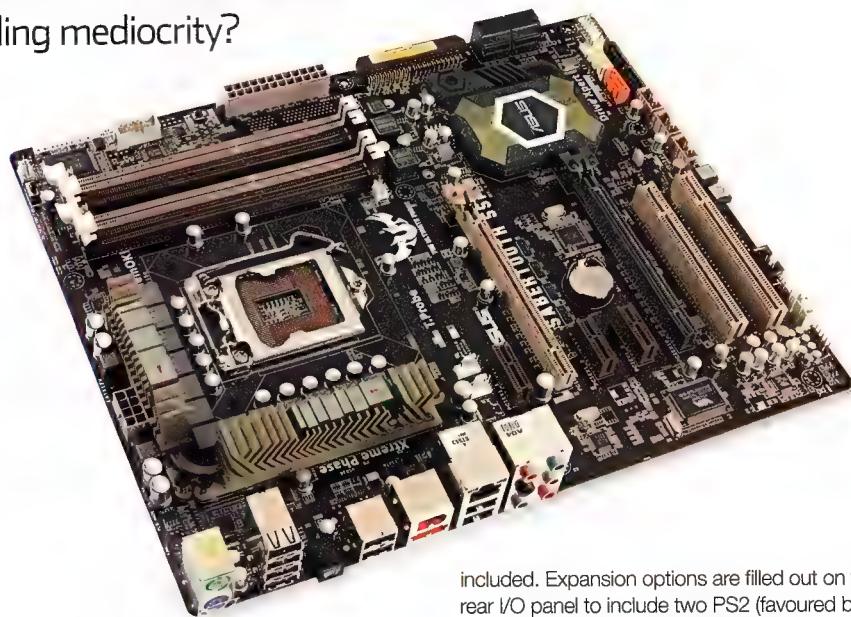
Website www.asus.com.au

Specifications Socket LGA1156; Intel P55 chipset; ATX form factor; 2x PCIe16; 2x PCI; 3x PCIe x1; 8x SATA; DDR3-1600

Premium motherboards usually come with a heap of features above and beyond anything you'd likely use in the average rig, and being packed with options means that they're usually a very good choice. Sometimes however you get an almost-there lion, one that comes close but doesn't quite fill in all the spaces – other times you just get kittens. The ASUS Sabertooth is most definitely a very angry kitten.

Most notable and interesting about this mobo is the inclusion of ASUS' latest 'innovation', the CeraMIX (yes, it's officially spelt that way) which comprises a ceramic coating on the PWM heatsinks as well as the small heatsink for the P55 Express chipset. Thankfully made from a *non-conductive* ceramic material, it's claimed to provide a higher surface area to dissipate heat – but on a mobo that doesn't generate that much to begin with the benefits are doubtful. Sure does look good though. In fact the looks are one thing about the board you'll love or hate, mixing brown and brown with brown and then some light green. And more brown.

That said the layout is still quite impressive, leaving plenty of space around the LGA1156 socket for bigger heatsinks or waterblocks. Around the socket is a less-than-usual amount of ultra-high quality power delivery components, pumping some reliably accurate voltage to the CPU that didn't waver noticeably during testing. This is very handy for overclocking, and removes some of the inaccuracies of varying amounts of vDroop (voltage discrepancies). There's plenty of room between the socket and the four DDR3 slots, and they're the same latching method as the Rampage II Gene (online here www.atomicmpc.com.au/?139582) – only requiring



one side to be secured.

Made even more obviously geared towards the premium end are the four fan headers around the top half of the board, though the 24- and 8-pin power connectors remain in the usual places. A right-angled IDE socket sits next to four right-angle SATA ports, with a further four vertical SATA ports at the bottom of the board. This is a huge oversight for a \$500 motherboard, and is actually a step backwards in storage options compared to cheaper offerings. There's no fancy LED screen or manual overclocking buttons here either, with only a pretty standard Power and Reset button included.

The expansion slots offer a relatively decent amount of flexibility, but strangely only include two physical x16 PCIe slots with an extra-wide spacing. These will run in dual 8x under Crossfire or SLI, but might prove limiting for future high-performance cards, made even more awkward by the inclusion of only a single long SLI cable – long Crossfire cables are not

included. Expansion options are filled out on the rear I/O panel to include two PS2 (favoured by overclockers), eight USB, Optical, 6-pin Firewire, eSATA, Ethernet and 7.1 channel audio.

Performance in this mobo at stock levels is actually worse across most areas than the ASUS P7P55D Deluxe from Issue 105, only slightly better with memory bandwidth but losing out with higher latency times. At the third OC level it is again slower, but this time is flattened into the dust by over two seconds in PiFast and a further almost two thousand points in Cinebench multi. One area that it improves on however is overclocking prowess, hitting a top speed of 4246MHz (193 x 22, 1.440V) that is 146MHz higher than the P7P55D Deluxe. It'll be much better with extreme cooling, but unless you're planning on benching heavily the Sabertooth isn't a great choice. Costing more, performing slightly worse, offering less features albeit with nice overclocking all add up to paying more, but getting less. (JP) JR

ASUS Sabertooth 55i

	17870 8-8-8-24	133x22; DDR3-1600 8-8-8-24	150x22; DDR3-1500 8-8-8-24	175x22; DDR3-1400 8-8-8-24
PiFast	24.54s	26.50s	22.98s	
wPrime 32M – single thread	36.069s	38.986s	33.463s	
wPrime 32M – multi-thread	7.739s (4.66x efficiency)	7.437s (5.24x)	6.363s (5.26x)	
CineBench R10 64-bit – single thread	4651	4669	5461	
CineBench R10 64-bit – multi-thread	18380 (3.95x efficiency)	19181 (4.11x)	21687 (3.97x)	
Everest Read	16202MB/s	14804MB/s	15574MB/s	
Everest Write	13859MB/s	12144MB/s	14179MB/s	
Everest Latency	50.0ns	46.1ns	44.2ns	



GIGABYTE P55M-UD4

Packing it all into a smaller space.

Street Price \$205 **Supplier** GIGABYTE
Website www.gigabyte.com.au

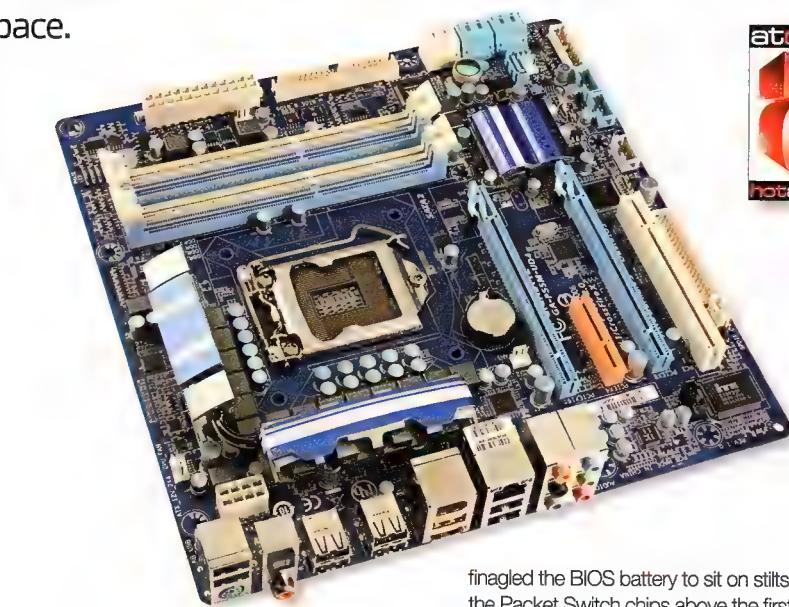
Specifications Socket LGA1156; Intel P55 chipset; ATX form factor; 2x PCIe x16; 1x PCI; 1x PCIe x4; 7x SATA; DDR3-1600

Gallery www.atomicmpc.com.au/?156342

When the average Atomican pulled the sidepanel off a system years ago and saw an mATX board lurking within the average reaction was to attempt to stab the thing with a screwdriver as quickly as possible – they were renowned for their lack of features, overclocking capability and tendency to kill you if you tried installing anything more exotic than a CD drive. Recent years and chipsets have cleared this up almost completely, and while you'll still occasionally get the funny motherboard in a prebuilt system for the most part they're almost identically-performing to the desktop counterparts, and therefore are (usually) a good choice.

The GIGABYTE P55M-UD4 seems to be a decent choice on the surface, with glossy racecar paint on the heatsinks and a well-organised PWM layout right next to the LGA1156 socket. While there isn't a buttload of room between the socket and the DDR3 slots there should be just enough for most large heatsinks, the benefit of this proximity being that the fan on the heatsink should keep its surroundings pretty decently cooled. Power needs for the board are supplied by 8- and 24-pin power cables sitting in the usual places, practically identical to the ATX layout. A vertical IDE port lies on the right-hand edge of the mobo, with six right-angle SATA ports underneath and a single vertical SATA port just behind them for a total of seven. Also just behind the storage options is a hard Power button.

This lower corner holds the front panel headers in all their colour-coded glory, as well as two USB headers and a single Firewire header. The P55 Express chipset is the only



one needed on the mobo, which saves some seriously needed space, cooled by the small chipset in the lower right corner. It got pretty hot when overclocked, but some direct airflow kept things under control. For those sticklers who still refuse adamantly to get rid of their Floppy drives there's a single socket at the bottom edge of the board, but annoyingly the front panel audio header is stuck up behind the I/O panel in usual GIGABYTE style.

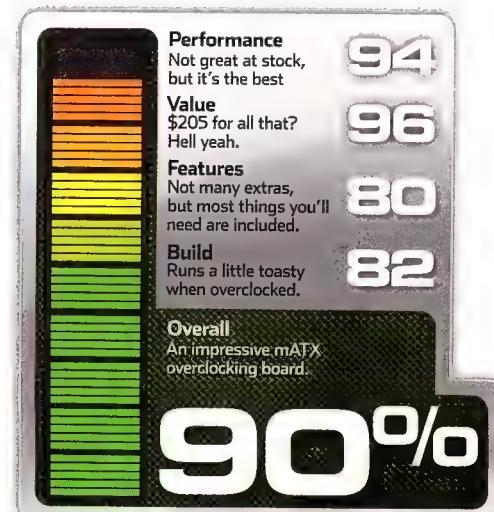
Interestingly the I/O panel itself is more filled with expansion options than a starving man at an all-you-can-eat buffet; with nine USB, one PS/2, Optical/Coaxial, 6-pin Firewire, one hybrid eSATA/USB, Ethernet and 7.1 channel audio powered by a Realtek ALC889A chip. Again keeping with this heightened expansion theme, there is capacity for SLI or Crossfire in both the 16x PCIe slots. Although limited to dual 8x by the inherent flaws in the chipset/platform design, this is the same speed you'd nab from a full ATX desktop P55 board. GIGABYTE's engineers have even

finagled the BIOS battery to sit on stilts just over the Packet Switch chips above the first PCIe slot, saving even more room on this very packed mobo.

Performance at stock settings is sadly not particularly impressive, coming in at slower than the GIGABYTE P55-UD6 across the board. However when the P55M-UD4 hits the third OC level it amusingly manages to overtake the ASUS Sabertooth 55i, blasting through all the tests to beat out the \$300-more-expensive mobo. Strangely already feeling like a board geared more for overclocking than for stock performance, this makes its full showing when pushed to the maximum speed of 4290MHz (195x22, 1.4375V) – even higher than all the premium motherboards I've looked at yet! Considering that this mobo is mATX and comes in at a price less than half of the others, it's half tempting to recommend this one for overclockers – though for extreme levels this board won't keep up that impressive pace. Definitely worth buying. 

GIGABYTE P55M-UD4

	17870	133x22; DDR3-1600 8-8-8-24	150x22; DDR3-1500 8-8-8-24	175x22; DDR3-1400 8-8-8-24
PiFast	29.81s	24.40s	22.85s	
wPrime 32M – single thread	44.068s	35.88s	33.57s	
wPrime 32M – multi-thread	8.503s (4.66x efficiency)	6.864s (5.24x)	6.398s (5.26x)	
CineBench R10 64-bit – single thread	4142	5066	5432	
CineBench R10 64-bit – multi-thread	16791 (4.05x efficiency)	20140 (3.98x)	22.199 (4.09x)	
Everest Read	14172MB/s	14927MB/s	15423MB/s	
Everest Write	10729MB/s	12210MB/s	14083MB/s	
Everest Latency	47.7ns	45.6ns	44.5ns	



Foxconn Inferno Katana P55

Black and red'll kill ya dead.

Street Price RRP\$430 **Supplier** Altech

Website www.altech.com.au

Specifications Socket LGA1156; Intel P55 chipset; ATX form factor; 2x PCIe x16; 2x PCI; 2x PCIe x1; 6x SATA; DDR3-1600

It's not often that flaming blades of death are used to sell motherboards, and perhaps in this case it might seem a bit odd. Foxconn hasn't exactly been known to be on the cutting edge of tech, releasing reference graphics cards and some decent motherboards – but the Katana seems to be an exception. Built around the ever-popular P55 Express chipset that connects via DMI directly to the CPU, only one chipset is needed on the board, which aids simplicity of design. It definitely has allowed Foxconn some leeway with colour, mixing bloody red splotches of colour over an otherwise dark board. The PCB isn't quite black, but the dark brown is still convincing enough inside a case.

Power to the LGA1156 socket is delivered by a 12-phase hybrid PWM design, using both analogue and digital power delivery components to supposedly give much better power. We found this to be incredibly inaccurate under use, with the BIOS reading a constant 1.2V vCore and measurement with software impossible. At a guesstimate from knowing the chip stability at certain speeds, 1.3625V roughly equalled 1.43V – and setting 1.43V manually blew this voltage much higher than we'd ever need to set, disrupting stability. It is definitely not intuitive, nor better than a standard PWM. Perhaps the only upside to this design is that the heatsinks did not get too warm under load, but matters are further confused with the listing of LGA1156 and LGA1366 socket capabilities on the mobo box – this is very misleading, and in reality is only LGA1156.

The one and only socket included on the board has plenty of space around it, though



doesn't show the usual dual mounting hole system that Foxconn seemed known for. DDR3 slots are placed well enough out of the way, and there is a strange feeling of parts missing around the socket – just look at the vast expanses of bare PCB. Foxconn do fill in a part of this PCB with a LED POST screen sitting on the right side of the mobo, which displays POST codes when booting and otherwise displays the current CPU temperature. A right-angled IDE socket sits next to six right-angled SATA ports on this edge, though strangely there are no further additional ports included. Power and Reset buttons lie in the bottom-right corner, joined by front panel headers and a cavalcade of USB headers.

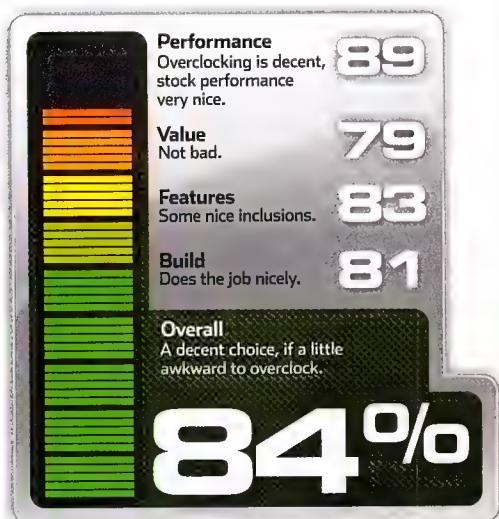
Expansion slots are decently filled out, but interestingly the P55 chipset's heatsink extrudes between the two 16x PCIe slots to dissipate more heat. This is a little strange considering that it can be cooled by the fart of a butterfly on the other side of the planet, but it sure looks neat. Reaching the rear I/O panel shows where some

of the bare PCB comes from, with additional features such as extra Ethernet, eSATA and Firewire all missing. However the inclusion of a PS/2 port, eight USB, Optical/Coaxial, Ethernet and 7.1 channel audio is more than enough for most people, and the included Clear CMOS button is a welcome sight.

Performance at stock levels is very impressive and is much faster than the ASUS P7P55D Deluxe, keeping this winning streak going until the second OC level. However, when it reached the third level the performance seemed to peter out somewhat, being left behind in the dust. Overclocking was an unusual experience thanks to the awkward power regulation, but a maximum overclock of 4.1GHz (187x22, 1.3625V set in BIOS, though the actual voltage is unknown) was reached without too much fiddling around. The Inferno Katana doesn't quite set a fire in our hearts, but it's a cool enough motherboard. 

Foxconn Inferno Katana P55

	i7 870	133x22; DDR3-1600 8-8-8-24	150x22; DDR3-1500 8-8-8-24	175x22; DDR3-1400 8-8-8-24
PiFast	24.28s	21.64s	22.41s	
wPrime 32M – single thread	36.267s	32.218s	33.56s	
wPrime 32M – multi-thread	7.751s (4.68x efficiency)	6.844s (4.71x)	6.622s (5.07x)	
CineBench R10 64-bit – single thread	4666	5292	5566	
CineBench R10 64-bit – multi-thread	18867 (4.04x efficiency)	20508 (3.88x)	21850 (3.93x)	
Everest Read	14492MB/s	15071MB/s	15845MB/s	
Everest Write	10895MB/s	12210MB/s	14106MB/s	
Everest Latency	46.3ns	44.9ns	44.6ns	



Sapphire 5750

Great budget performance.

Street Price \$210 **Supplier** Sapphire
Website www.sapphiretech.com

Specifications 700MHz core; 1150MHz memory (4600 effective); RV870 core; 720 shader units; 1024MB GDDR5; 128-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector

While everyone would love to be running high-end cards in their rig, sometimes they're just too far out of reach for the Average Joe – so enters the mid-high end cards. They're a little cut down with features, but what they lack in technological grunt is more than made up for with value. The Sapphire 5750 is definitely right in this range, but the specs might surprise.

Running a 40nm 'Juniper LE' core there are 720 shader units paired with 1GB of GDDR5 memory on a 128-bit memory bus. This is only 80 units shy of the previous generation's 4870, but the core clock has been dropped from the 4870's 750MHz to only 700MHz. Memory speeds are quite high at 1150MHz however, and there's a huge amount of bandwidth afforded by the use of DDR5, with a decently wide 128-bit bus to get the data pulled through. Transistor counts highlight the major difference between this 5750 and the higher-end 5870; running only 1.04 billion.

The performance is almost what you'd expect from an underclocked and slightly crippled 4870, though sadly seems underperforming in Crysis and GRID to the tune of 13 and 26 average frames respectively. Performance is only 1200 points off in 3DMark06, but lags behind by over 2000 points in 3DMark Vantage. The reality for owners of the 4870 is quite simply, not to upgrade to this card.

However that doesn't mean it's a bad one, and physically the card certainly does catch your



eye in a very appealing 'come hither' way. The glossy black shell might not be for everyone, but the large fan inside blows directly down onto an all-aluminium heatsink that remained cool enough under load to have us concerned it wasn't really contacting at all. Temps at idle were a chilly 35 degrees Celsius at a decent 52.1dBA, but they only slightly creep upwards to 54 degrees at a loud 60.5dBA at load. Perhaps not quite silent, these temps are thanks to the 86W power consumption of the card at load, falling to only 16W at idle. Considering that many light bulbs devour 60W just to help us see, this is pretty impressive.

The card is very small and only slightly extends past the PCIe 2.0 connector, with a bright blue PCB in Sapphire's traditional colours. Display options are incredible for a card at this price; packing two DVI, HDMI and DisplayPort into the expansion bracket for three screens at once.

You can even run two of them in Crossfire, but only within the same 57xx series of cards due to core architecture limitations.

Bundled in with this card is a Steam download code for DiRT 2, which will be a nice way to show off the DX11 tech when it is finally released with an update to both Vista and Windows 7. Another odd inclusion is a GPGPU app plugin called SimHD by ArcSoft, which aids the video quality of webcam through MSN, but it's nice to see other software being bundled in apart from just games.

The 5750 slots in a very strange position in AMD's lineup, and while older 4870s are still on the market around the same price you'd be best off grabbing one of those over a 5750. However once supplies of the older card dwindle, this card will be a nice value option for gamers looking for a decent speed and a great bundle. Strong competition is still being applied from the green team in the form of the GTS250 that performs almost identically to this card, so grab the 5750 for a good bundle and lower power consumption.  JR

Sapphire 5750 3d Mark scores



Sapphire 5750 Gaming Benchmarks



Performance
Not bad, DX11 performance yet to be seen.

Bundle
DiRT 2 and SimHD are great.

Value
Nice value for all this stuff.

Build
A little gaudy, but otherwise nice.

Overall
A great value card with decent performance.

85%

ASUS 5870

Just a little expensive.

Street Price \$680 Supplier ASUS

Website www.asus.com

Specifications 850MHz core; 1200MHz memory (4800 effective); RV870 core; 1600 shader units; 1024MB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector

Card info www.techpowerup.com/gpu/f34hm

A new wave of graphics cards from the Red team brings us a new hierarchy of performance, one that is practically identical to the already-existing order of cards. With the 5870 sitting proudly at the current top of the pile (at least until the 5870X2 is released), each subsequent card underneath this number will perform predictably worse. So by that logic, this card from ASUS should be great – in theory.

Built around the RV870 ‘Cypress’ core, manufactured in a 40nm process, there are a total of 1600 shader units that work in tandem with 1GB of GDDR5 memory on a 256-bit memory bus. This is a huge amount of processing grunt, and the sheer memory bandwidth here is plenty to keep them well fed. Keeping the memory size to 1GB makes sense too, as it is only very rarely that a game will need more space than this per core.

It rocks in at the reference clocks of 850MHz on the core and 1200MHz on the memory, the latter quad-pumped to an effective 4800MHz. Power needs are hefty at a TDP of 188W, but this can be supplied through the PCIe 2.0 bus as well as two 6-pin PCIe connectors. This power bill actually drops at idle to roughly 27W, meaning that you can easily rest your hand on the card – though this is also possible at full load. Temps at idle were only 34 degrees at a quiet 50.3dBA, rising to 65 degrees and a noticeably loud 59.0dBA at load.

Cooling needs are supplied by the stock



cooler on the card, only discernable as ASUS by two small stickers. The outer shroud is styled almost identically to the Batmobile from 1966, imposingly black and red. It's made from a high quality plastic, with a top plaque showing off that it's an ATI card. A single squirrel-cage fan intakes cool air at the end of the card, pulling it in and through the aluminium fins with copper mounting block kept inside, finally exhausting some hot air out the rear of the case. There is a significant amount of spillover that pours out where the two Crossfire nipples reside, but this is forgivable considering the two DVI, HDMI and DisplayPort connectors included.

While this card does look pretty great it's also dauntingly long, coming in at even longer than a single-PCB GTX295, overhanging the ATX motherboard by an inch. Checking the space inside your case before buying is definitely recommended.

Gaming performance is reliably impressive, averaging 80fps in Crysis and getting well over a hundred frames in GRID. Even both 3DMark scores were nice and high, and this card is more than powerful to run any game out there on full detail at a decent resolution. Performance was further increased when overclocked, although the included utility from ASUS was awkward to use. Called Smart Doctor, it claimed to allow voltage tweaking – well sure, but only downwards from stock levels. We stuck to the AMD GPU Clock Tool, raising the core an extra eight per cent to 922MHz, and the memory up an extra five per cent to 1260MHz (an effective 5040MHz).

Included in the box is a Steam download code for DiRT 2, one of the first DX11 games that'll be hitting stores sometime in December this year. It's a very nice inclusion that seems counterbalanced by the incredibly high price; at \$680 it seems there's a random price bump added for simply being an ASUS product. If you're a diehard ASUS lover it might be worth it, but paying \$150 over the competition to get a nice sticker or two seems counterintuitive.

BY JR

ASUS 5870 3d Mark scores



ASUS 5870 Gaming Benchmarks



GIGABYTE

BEAT ME NOW!!

BEAT ME IF YOU DARE

GRAPHICS OC COMPETITION

SUPER
OVER
CLOCK

OC YOUR WAY TO
A NEW GRAPHICS CARD

OCT 1st — DEC 31th

Official event website: <http://event.gigabyte.com.tw/BeatMyselfYouDare/>

Galaxy GTX295 OC

Is that a blue spider?

Street Price \$650 **Supplier** Galaxy
Website www.galaxytech.com

Specifications 650MHz core; 1100MHz memory (2200MHz effective); 1401MHz shader clock; GT200 core; 240x2 stream processors; 1792MB GDDR3; 448-bit memory interface; dual slot PCB with active cooling; 6-pin, 8-pin PCIe power connector

Card info www.techpowerup.com/gpuz/nuepa/

There have been some elegant showcases of technological design in the history of humanity, from the first transistor radio to the more recent satellites that we've got spinning around our skies. The first iteration of the GTX295 was about as inelegant as an oiled-up silverback gorilla in a bikini at a fruit festival, comprising essentially two cut-down GTX285s slapped together haphazardly with a lump of metal in between. Thankfully the slightly-too-clever engineers at NVIDIA rethought this awkward design, stripping away the second PCB and fitting all the components onto one PCB that comes in at a length just shy of a single-cored 5870 – bringing elegance back into this high-end card.

Running under the hood are two of NVIDIA's best GT200 chips, offering 240 stream processors each at a core clock of 650MHz (a 74MHz increase over reference). Each core has a slightly cut-down memory bus of 448-bit wide and access to 896MB of GDDR3 memory at 1100MHz (92MHz above reference) for large amount of bandwidth. While the total capacity is listed as 1792MB this is relatively misleading, as each half is a mirror copy of the other.

Physically the card is pretty impressive, covered with a black shroud that holds a large 92mm fan centrally mounted between both GT200 cores. Each core has its own individual



heatsink, comprising a copper block with thick aluminium extruded fins. While some heat is vented out the back of the case, an equal amount makes its way inside the case thanks to the design of the shroud. This separate heatsink design is obviously the best solution to cool the card, though creates a strange feeling of something missing in the card's middle. The big blue sticker on it looks quite neat, and we were interested enough in the design to completely pull it apart (as seen online here www.atomicmpc.com.au/?156155).

Thanks to the crowded PCB the memory chips are placed on both sides of the board, with two large aluminium plates used to keep temps under control. Even though there are two of NVIDIA's hottest cores used, temperatures at idle are a relatively sedate 46 degrees Celsius at a decent 57.1dBA, rising to a manageable 65 degrees at 60.3dBA. One major drawback of this design is sheer heat output – devouring a maximum TDP of 289W under load means that

not only does it devour 101W more than a 5870, but it will make a noticeable effect on the average internal case temperature.

Even with the large TDP and pre-applied factory overclock the card still manages to eke out an extra six per cent overclock to 687MHz and five per cent higher on memory to 1150MHz, but this was not as high as the XFX GTX295 we've looked at, which can clock to 711MHz on the core. Performance is where most people would be looking first, and stock levels are... interesting. Being roughly the same as the aforementioned GTX295, at the time the fastest card available, with the launch of ATI's 58 series we've finally seen a flip in leadership.

The two NVIDIA cores in this card barely squeeze out 74.45 frames per second in Crysis, surpassed by the 5870's single core performance of 80.83. While GRID performance is neck-and-neck, the ATI card wins in 3DMark06 by just over a thousand points. Only in 3DMark Vantage does the GTX295 take the lead; though this is heavily skewed by PhysX and is only useful to compare to other NVIDIA cards. Considering that there's no game included with the Galaxy GTX295 and performance is surpassed by a cheaper single-cored solution that uses less power, this is a poor choice. 

Galaxy GTX295 OC 3d Mark scores



Score

Galaxy GTX295 OC Gaming Benchmarks



Frames per second

Performance
Still fast, but surpassed.

88

Bundle
Cables and assorted accessories.

70

Value
Not a good prospect.

60

Build
Cleverness can't help large power consumption.

85

Overall
Decent performance, but is quickly aging into obscurity.

72%

GIGABYTE 5770

Missing something important.

Street Price \$250 Supplier GIGABYTE

Website www.gigabyte.com

Specifications 850MHz core; 1200MHz memory (4800 effective); RV870 core; 720 shader units; 1024MB GDDR5; 128-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector

Card info www.techpowerup.com/gpuz/2v3py/

GIAGABYTE has been a partner with ATI/AMD for many years, usually part of the first wave of reference board releases and typically offering a decently priced card with a few tempting extras. In the past GIGABYTE has bundled in the original Dawn of War, Neverwinter Nights 2 and plenty of other games – but the very first thing we noticed with this 5770 was the complete lack of a game. All the cables you'd expect to be included are here, along with a driver disc and manual, but there's no game included anywhere in the box. Not even a download offering is available, meaning that for slightly more than XFX's offering you get a card with no game, seriously hurting the card's value.

Technical specs remain the same as any reference 5770 card, sitting at a speedy core clock of 850MHz with 1GB of GDDR5 memory hustling along a 128-bit wide memory bus giving a bandwidth of 76.8GB/s. There's a complement of 720 shader units used, and 1.05 billion transistors included in a die of 170mm². The TDP is relatively sedate, using well under 100W at load and only 18W when idling on the desktop. Being manufactured on a 40nm process means that a large number of these cores can be produced on a single 300mm silicon wafer, cutting down costs and hopefully translating to lower prices once the process is refined enough to meet demand.

Physically the card is pretty similar to the



high-end 5870's design, incorporating a large black shroud that contains the aluminium fins and copper heatsink within. One relatively large squirrel-cage fan sucks in cool air at the end of the card, pulling it from within the case and pushing most of it out the rear of the case. Interestingly a black PCB has been used, eschewing the traditional GIGABYTE blue colour in lieu of something perhaps a little better. Power needs are delivered via a 6-pin PCIe connector at the end of the card, annoyingly placed within a plastic moulding that interferes with the cable when attempting to remove it. Two Crossfire nipples lie at the top edge of the card in the usual location, and the entire length of the card is covered with a bright red acrylic plate showing off an ATI logo.

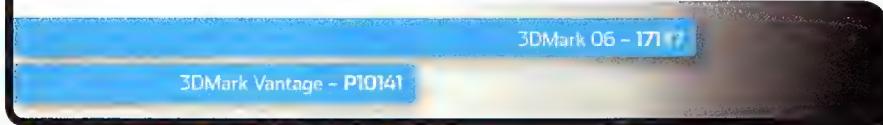
The cooler does a decent job at keeping temperatures down, idling at 44 degrees Celsius at 52.1dBA and rising to 59 degrees at an uncomfortable 61.8dBA load. This noise will be

muffled somewhat by the case and any game noise, but is still distracting. Overclocking went very well, the heatsink allowing the core to be increased thirteen per cent to 957MHz, memory speeds rising eight per cent to 1300MHz. Memory bandwidth increased by 6.4GB/s to a speed of 83.2GB/s, a good amount that should keep the core more than busy with data.

Performance of the card was a little odd compared to the XFX 5770, returning lower average frames in Crysis and GRID by three and seven respectively, though actually performing slightly higher in both 3DMark programs. This can most likely be attributed to normal deviation in scores, and is otherwise identical in performance.

While the overclockability remains good and the card itself performs decently, the lack of any serious bundle and a price slightly higher than the competition for what is essentially less value means that this GIGABYTE card is only really something you should grab if you're after a second card for Crossfire, or if it's the only one in stock when you're going to buy.

GIGABYTE 5750 3d Mark scores



Score

GIGABYTE 5770 Gaming Benchmarks



Frames per second

Performance
Subpar at stock, but overclocks well.

Bundle
Nothing apart from cables.

Value
Not much worthwhile here.

Build
Loud at times, but cool enough.

Overall
Doesn't come with enough to justify the price.

80

65

70

32

74%

XFX 5770

XFX rolls out its budget-end offering of the new ATI 5-series.

Street Price \$245 **Supplier** XFX

Website www.xfxforce.com

Specifications 850MHz core; 1200MHz memory (4800 effective); RV870 core; 720 shader units; 1024MB GDDR5; 128-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector

Card info www.techpowerup.com/gpuz/9cn3v/



13% OC

Most people buy a graphics card for one or two things; games or video. Some buy them because they look badass in a system, but really it all boils down to what we can do with them once they're in there. The XFX 5770 is similarly specced to the 4890 from ATI's previous generation, but there are a few key changes that are important to note.

First and foremost is the manufacturing process drop of 15nm to only 40nm, packing the same 800 shader units into a significantly smaller space. They're running at an identical core clock speed as the 4890, and 850MHz should mean they're roughly the same in performance. 1GB of GDDR5 on a cut-down 128-bit memory bus should mean decent memory bandwidth, but it's a step backwards from the 4890's 256-bit bus. This is partly negated by the clock increase to 1200MHz on the memory, up from a sedate 975MHz.

Physically it's clear that this card isn't aimed at the same market as the 4890, being a quite a decent length of less than 9in. It's built around a brown PCB, with a large black plastic shell on top. The manufacturing quality of this shell seems to be much less than the higher-end models as some of the red plastic strip in the middle seemed poorly shaped, but it still manages to eke out a definite Batmobile feel. One large squirrel-cage fan at the end of

the card draws in all the air needed to cool it, sucking cooler air past the fins inside and finally exhausting mostly out the back of the case. Some hot air is dumped past the twin Crossfire nipples to enter the case, but this is negligible.

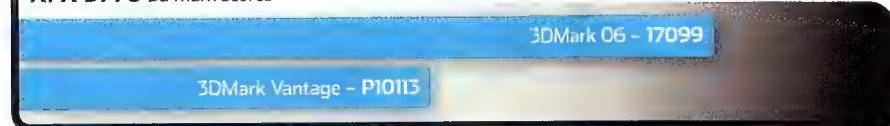
Display options continue the current 5xxx series trend of being more than most people would know what to do with, offering two DVI, HDMI and DisplayPort connections. Power needs are filled with a single 6-pin PCIe power connector, and the 5770 will draw 108W load with 18W at idle. This is the maximum power for load, but it'll only increase when overclocked. Speaking of which, the maximum core clock reached was a 13 per cent increase to 959MHz, with memory also increasing 13 per cent to 1360MHz. This is a pretty nice overclock, and there's definitely some wiggle room either side. At stock settings temperatures barely grazed 45 degrees with a decent 52.0dBA, increasing to 61

degrees at a distractingly loud 61.1dBA.

Performance unfortunately doesn't stack up to the older 4890; hindered by the cut-down memory bus, there's a slight decrease across all the benchmarks and games. There's still a few 4890 cards floating around out there for practically identical prices, but the 5770 boasts much lower power for the same price and close performance. One area that the 5770 definitely trounces the older generation is the generous bundle, but the game chosen is a quirky copy of BattleForge. It seems to be a card-based PvP game that was released in March 2009, apparently to little fanfare. It'll also be patched at a later date to support DX11 (as proudly proclaimed by the sticker on the front of the box).

Assuming you can find stock of the 5770 it'll do you pretty well for the money, but for those with 4xxx series cards you'll want to look into the 58xx series for a worthwhile upgrade. On the green team you're looking at a rough equivalent of a GTX260, a card slightly hotter and faster but not quite so well-bundled. For DX11 on the cheap, the 5770 is a nice pick.

XFX 5770 3d Mark scores



XFX 5770 Gaming Benchmarks

Crysis
Race Driver: GRID



Performance
Not bad, DX11, 13% overclock.

Bundle
BattleForge might not be for everyone.

Value
A little pricy, but the game is a nice inclusion.

Build
Sometimes loud, otherwise standard.

Overall
A nice entry path into DX11.

83%

Noctua NH-U12P

Another solid cooling choice from enthusiast favourite, Noctua.



Street Price \$85 **Supplier** Mittoni
Website www.mittoni.com.au

Specifications Tower heatsink, 8 heatpipes, aluminium fins, two 120mm fans included

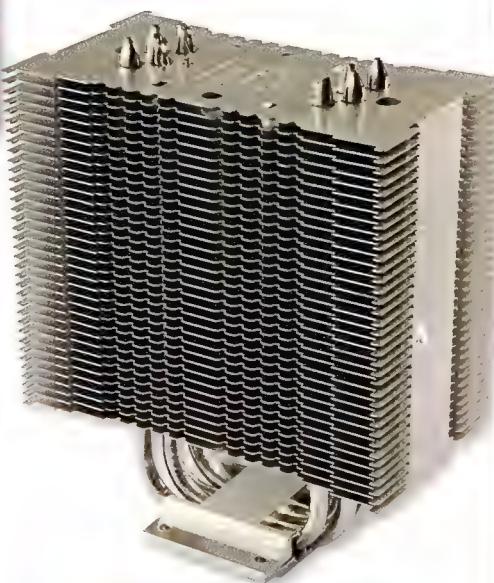
Gallery www.atomicmpc.com.au/l55061

Heatsinks are not something that many people would think of to upgrade, and are one of the few areas that people skimp on when putting together a new rig. The benefits of a good one are clear; cooler temperatures mean better overclocks, usually at a lower noise and they make your system exude awesomeness when they're installed. This heatsink from Noctua does all these things, but the main point of difference is that Noctua also throw in twice as much fannage as other heatsink manufacturers. You could use one for the heatsink and whack the other one anywhere in your system (or even as a cool

paperweight), but they're best used in tandem.

The heatsink itself is designed in the traditional tower layout, bending four heatpipes into the U shape traditionally used for horseshoe throwing. Unlike horseshoe throwing this heatsink is actually useful for keeping the CPU cool, with temperatures remaining quite nice at stock levels as well as hitting a good maximum when overclocked at full OCCT load. Even more impressively, both fans remained at a solid 54.1dBA regardless of the heat load from the CPU, in part thanks to the 3-pin fan cable used for each and the low 0.09A power draw that kept them spinning slower (therefore quieter).

Socket support is very good, spanning the entire range of sockets from AM2/AM2+/AM3, to LGA775/1156/1366. The mounting system is a little fiddly requiring four screws, a backplate, four nuts, two brackets, four plastic spacers and the heatsink itself. Once installed the heatsink is as sturdy as a pack mule, and will gladly take almost any load you give it without braying too loudly. A tempting price of only \$85, two fans with heatsink compatible with everything and performance identical to a Thermalright Ultra 120 eXtreme mean that this heatsink is a win in our books. 



Noctua NH-U12P

	Load	Idle
3.2GHz, 1.2V	52	36
3.6GHz, 1.375V	62	38

CoolerMaster Silent Pro M1000

Beefy and modular, but warm.

Street Price \$295 **Supplier** CoolerMaster
Website www.coolermaster.com

Specifications ATX form factor; 24-pin, 2x 8-pin CPU, 6x molex, 9x SATA, 1x Floppy, 6x 8/6-pin PCIe.

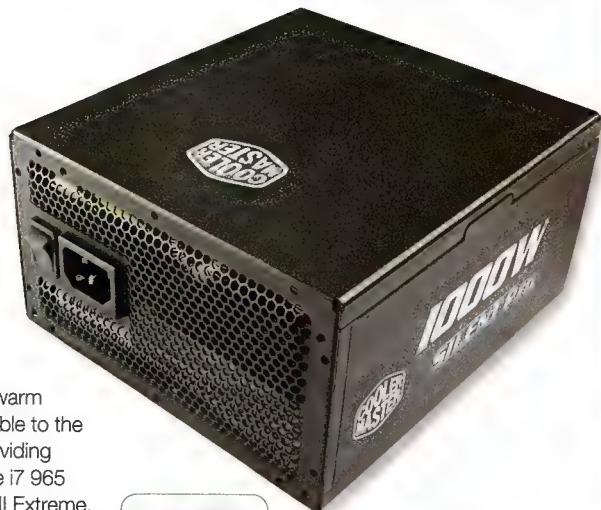
CoolerMaster has made quite a few power supplies over the years, filling out its complement of cases and heatsinks to include PSUs over every portion of the power supply scene. The Silent Pro M1000 is a modular unit with hardwired 24- and dual 8-pin power cables, offering a whopping six PCIe cables for triple SLI or Crossfire setups. Oddly, though, there aren't many molex cables, nor is there an overabundance of SATA cables, quite strange considering the wattage of the unit itself.

Encased in a matte black case, this PSU has a honeycomb grille at the rear that is pushed outwards, making it look slightly interesting. It comes with a silicon sheath in the box that mounts between the case and PSU, minimising vibration a touch. Also included is a thick power cable, keeping in mind that if this unit ever got to full load it'd be drawing well over 1100W from the socket thanks to its 85 per cent

efficiency, which nets it an 80Plus Bronze rating.

It's cooled by a large 135mm fan that pushes through a decent amount of air, keeping the PSU relatively cool – although under load it did get noticeably hot, exhausting warm air. There's a buttload of power available to the single 12V rail to the tune of 80A, providing 960W. Hooking up our testrig of Core i7 965 (3.6GHz @ 1.375V), ASUS Maximus II Extreme, two 5870 cards let us run OCCT with 3DMark Vantage Extreme preset.

The 12V rail idled at 12.205V and dipped down to 12.168V under load, a noticeable waver. The 5V rail remained relatively stable from an idle of 5.076V to a load of 5.071V. This PSU has a nice price for the wattage and multi-card options, but we'd prefer higher efficiency and improved rail stability. 



Sony MDR-XB700

Get some bass in yo' face.

Street Price \$180 Supplier Sony
Website www.sony.com.au

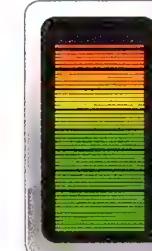
Specifications 1.2m cable length; 50mm neodymium drivers; 24ohm resistance; 3.5mm jack; 3-28,000Hz.

Headphones are usually one of the last items you'll nab when getting a serious gaming setup, but for those without the need for a microphone this headset is pretty damn close to gaming nirvana. Built rock-solid and sporting dual neodymium 50mm drivers, it's got absolutely *giant* cups with smooth leather padding that is comfortable to wear for even long periods with glasses on. They're closed and can get a little warm if you're walking around, but they also manage to block out a huge chunk of external noise – like you're in your own musical world. You'll feel a bit badass with them around your neck too, but the sound is definitely the best part of this set of cans.

When most headphones claim to have 'extra bass' you usually get a pissy attempt at straining out a few more of the lower frequencies, but here the gigantic drivers give a frequency response all the way down to 3Hz. That's entering well

into the fifteen inch subwoofer territory, and any bass boomed more impressively through the cans than any other headset I've ever tried. Pendulum's 'Hold Your Colour' thumps through powerfully without distorting the high end noises at all, and while the midrange is drowned out slightly by the bass it's the best listening experience you can get short of audiophile quality gear.

Sadly this means that songs without a strong bassline can sound a little washed out, but you won't be let down if you're into anything with bass – gunshots and explosions have never sounded more real, making an immersive *whump* as a grenade goes off near you. They're so good that listening to 128Kbps MP3 files reveals the compression noises; 320Kbps or CD/lossless is a definite must with these cans. They're a bit expensive, but for sheer bass they're worth every dollar.  JR



Overall
Just too good for MP3.

92%

Creative Sound Blaster Arena

White is the new black.

Street Price \$127 Supplier Creative
Website <http://au.creative.com/>

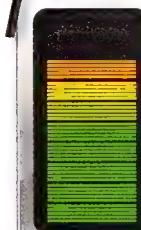
Specifications 2.5m cable length; 40mm neodymium drivers; 22ohm resistance; USB; 20-20,000Hz.

It's nigh on impossible to be in the gaming scene without hearing of Creative pairing with Johnathan 'Fatal1ty' Wendel, whacking his name and stamp of approval on a whole range of gaming gear. Whether it actually makes much difference is up in the air, but the latest gaming headset has hit with a very strange choice in USB connectivity and inbuilt X-Fi processing. It's got two standard sized 40mm drivers, but these are housed in two cups that can rotate to fold easily to chuck into a backpack. Relatively strong plastic is used in construction with a cheap leather pad on each cup, as well as a single microphone that feels quite floppy and silly.

However you don't buy a headset to look at it, so whacking them on and firing up the annoying bloated software needed for use (taking up over 190MB for audio drivers is just insane) I gave it a run through with some music in MP3 form. It sounded much warmer

than usual, with punchy bass, but muddy midrange and higher-end noises that seemed blown far out of proportion. Creative's 'X-Fi Crystalizer' was to blame, though to be fair it did help some songs sound better – it just wasn't consistently improved.

CD audio fared better, though the detail in the sound felt a little limited by the drivers. The closed design of the cups managed to block most sound, but the small space in them meant that they got hot and uncomfortable after even small periods of use. Thankfully they performed excellently when it came to positional audio like you'll get in games, with sounds feeling like they were *just* behind your shoulders and *whizzing* past somewhere ahead of you. Not one for music listeners, but it'll serve a gamer's needs very well.  JR



Overall
A bit warm, but positional audio is impressive.

80%

Kingston KHX2133C9D3T1K2/4GX

Most awkward name ever.

Street Price TBC Supplier Kingston
Website www.kingston.com

Specifications 2x 2GB kit; DDR3-2133; 9-9-9-28; 1.65V; 240-pin DIMM; Non-ECC Unbuffered DDR3

Last month's ultra-affordable Ripjaw kit was incredibly great value for the performance, but this Kingston kit surpasses even the performance of that kit by far – and that's just at stock settings. Running at a stock speed of 2133MHz at 9-9-9-28 1T timings, this kit has an astounding memory bandwidth with a Core

i7 870 on a MSI P55-GD65 mobo of 20555MB/s and a very low latency of 40.0ns. Two identical sticks of 2GB each add up to a total of 4GB in dual channel, meaning that you'll need to be running a 64-bit operating system to take full advantage of the space (though really you should've moved over years ago).

Physically this kit is quite interesting to look at though the large heatsinks remained cool at all times, being awkwardly tall at the same time. They'll interfere with some heatsinks as well, so watching mobo slot placement is definitely required. All the information you'd need about them is packed into that gigantesque name, and is also packed into the XMP profile that inadvertently overclocked the CPU to 3.9GHz to reach a speed of 2133MHz.

This already impressive performance was further increased by upping the bus speed of the CPU and dropping the multi so it remained at 3.9GHz, for a final overclocked speed of 2276MHz at tight timings of 9-9-9-26. Definitely worth grabbing this kit if you're ever intending to overclock your rig.  JR

Kingston KHX2133C9D3T1K2/4GX

i870	2133MHz; 9-9-9-28 (1T); 1.65V	2276MHz; 9-9-9-26 (1T); - Stock
		1.74V
Hexus PiFast	22.65s	22.14s
wPrime 32M 8x	6.396s	6.209s
Everest Read	20555 MB/s	21566MB/s
Everest Write	18225 MB/s	19184 MB/s
Everest Latency	40.0 ns	38.0ns



Overall
Huge performance,
and very tweakable.

91%

XFX 850W Black Edition

XFX's first PSU ever is set to make waves.

Street Price \$299 Supplier XFX
Website www.xfxforce.com

Specifications ATX form factor; 24-pin, 8-pin ATX, 9x molex, 11x SATA, 2x Floppy (via Molex adaptor), 2x 8/6-pin PCIe, 2x 6-pin PCIe.

It's not often that we'll get a brand new product around Atomic that actually manages to turn our heads, but XFX's first foray into the PSU scene has managed that and more. Even just looking at the unit's recessed bright green neon fan with grille, flares and even plastic moulding makes you immediately interested. While the looks might not be for everyone, this modular design shows all the features that we're after in a PSU, such as a 135mm intake fan, more cables than you can poke a stick at (all sleeved), plenty of ventilation at the rear and a Silver 80Plus certification.

Included in the box is a power cable as thick as my pinky finger, and even the intricate packaging is impressive. It exudes awesomeness from every pore, but it isn't just visually awesome – performance is damn near close to the best we've seen yet. Loading up our test rig with a Core i7 965 (3.6GHz @ 1.375V), ASUS Maximus II Extreme, two 5870

cards and running OCCT with 3DMark Vantage Extreme preset gives us our stress test. An idle 12V reading of 12.220v is within tolerances but under load this hardly wavers at all, dipping barely to 12.207v. Even the 5v rail idled at 5.140v and increased slightly to 5.150v at load, meaning the power delivery here is top-notch.

Under load the PSU felt a little warm on the underside of the unit, mostly due to the slow-spinning fan. Once it hit the right temperature the fan ramped up, and kept temperatures to a reasonable level without too much noise. In fact everything about this PSU seems cool, and while the neon green colour scheme belies the Black Edition moniker it is definitely unique, but the performance is something that other PSUs wish they could have. Definitely recommended.  JR



Overall
A powerful first
showing from XFX.

94%

Corsair Obsidian 800D

A surprise hit from a surprise quarter...

Street Price \$390 **Supplier** Corsair
Website www.corsair.com

Specifications 609 x 609 x 229mm (H x L x W); 5x 5.25in drive bays, 4x 3.5in hot-swappable SATA drive bays, 2x 3.5in drive bays; 1x 140mm fan (rear), 1x 120mm fan (drive bays), 1x 140mm fan (bottom); 7x expansion slots; 4x USB 2.0, 1x IEEE1394, 1x Headphone, 1x MIC; ATX, mATX, EATX; Aluminum Faceplate, Steel Structure.

Corsair may be better known for its solid memory products, and more recently PSUs, so you might be led to wonder what the company is doing in the case market. Well, there's a simple answer to that:

Being awesome.

The Corsair Obsidian 800D is a matte black wunderkind of case design. We always enjoy unboxing a new case at Atomic; whether we're expecting brilliance or insanity, it's always a lot of fun to pore over a new design, but the unveiling – the only way we can put it – of the Obsidian had everyone simply lost of words.

This is a big tower case, with a simple window and a plain fascia. It's a touch Lian Li, too, and that certainly helped improve our first impression, but when you start to pay attention to even the external details, you start to think that Corsair's stolen a march on our heroes. The brushed aluminium is elegant, IO access solid, and even the power buttons leave you with that feeling of well-engineered bliss. Looking closer again, there's a lovely mesh inset no the top of the case, with screw mounts just waiting for a radiator to power a watercooling loop. The sidepanel impresses, too, as when you slip the side panel off, it

reveals screws – removing the window will be easy, meaning any future modding can be done without scratching it. Lovely.

The internals are the same lightless matte black as the exterior, but while we were cooing over that, we were stunned to see not just one or two, but four hot-swappable SATA bays. This is great stuff – not groundbreaking (Lian Li got there first), but considering this is a sub-\$400 case, we're sold on that alone. There's lots of other room for drives of either 3.5in or 5.25in variety, all secured with a combination of toolless clips and traditional screws.

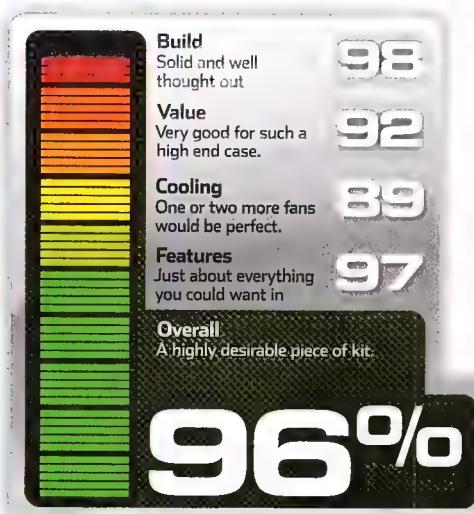
The generous expansion slots are of the simple screw-in variety, and that too we like. Toolless designs rarely impress in this area of the case, given that a truly Atomic rig will be sporting one or more giant video cards. The rest of the internals are wonderfully roomy, featuring a slide-out motherboard tray; there's a great plastic cover to access the rear of your mobo, too, letting you install new heatsink mounts with ease. There's lots of grommeted cable runs, too, and even the included cables for the front IO are nicely sheathed in black plastic.

About our only gripe is fan placement. Two of the internal fans don't quite match up to any external grills, and there are no fans on the



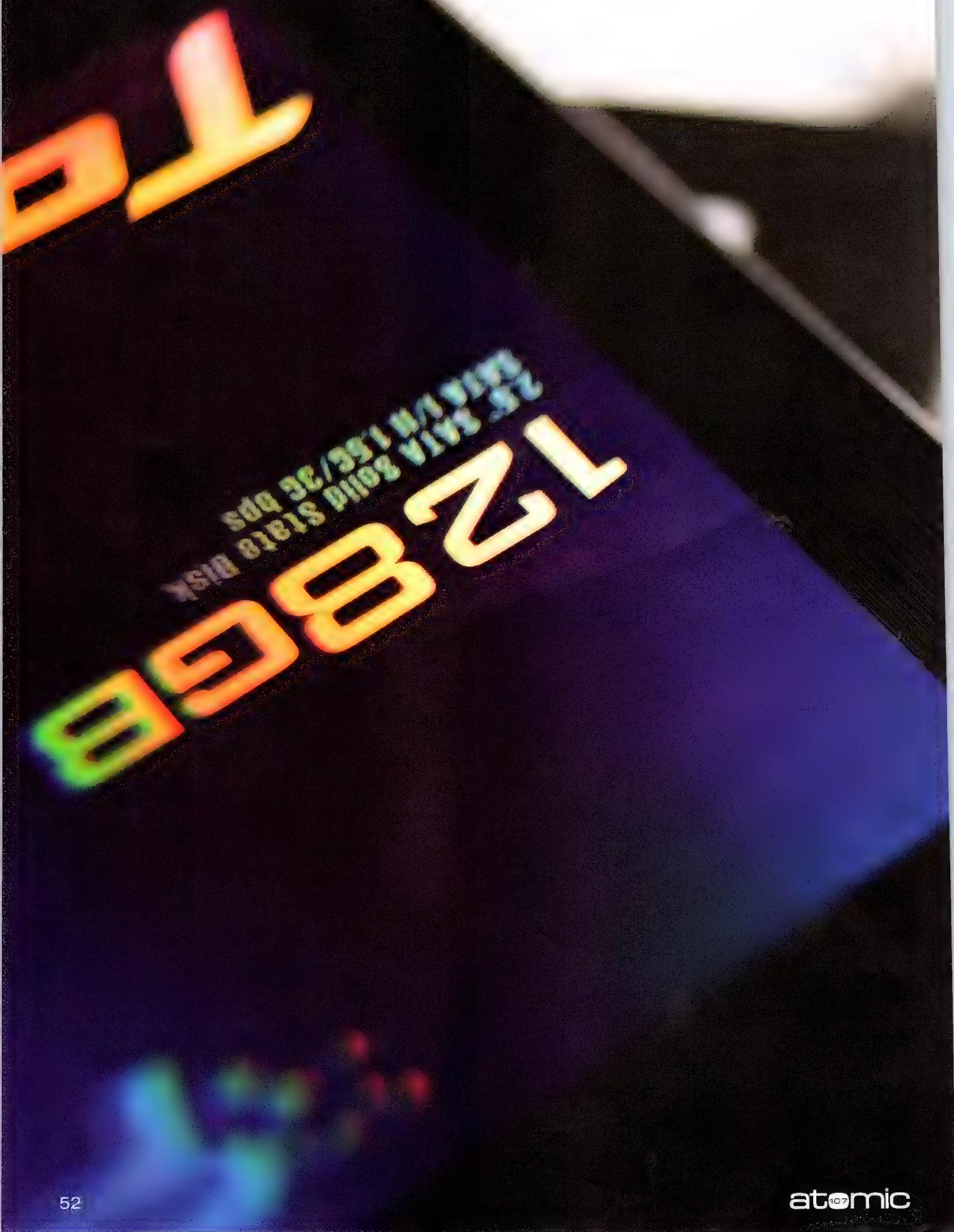
front pulling cool air into the case. Instead, you're relying on internal movement and one exhaust fan to manage airflow. Adding fans won't be a chore, though, but it does seem a slight oversight. That said, this case is very much a water-cooler's delight, so if you're going that route, airflow is less of an issue.

This case took us very much by surprise, but in that best of ways. If there are more cases coming in the Obsidian family, we can't wait to see them.  DH



HARDWARE

HEAD



[Solid] State of the art

James Gorbold, Harry Butler and Antony Leather
ride the next wave of storage technology.

Although most enthusiasts focus their attention on which GPU to upgrade to next, as a more powerful graphics card will allow you play games at a higher frame rate or increase to higher detail settings/resolution, a new drive can potentially have an even bigger impact on your overall PC experience. That is, if you're an obsessive-compulsive silent computing freak.

However, with an SSD (solid-state drive) installed as your boot drive you can kiss goodbye to long boot times, sluggish game loading and the annoying pauses from which a hard disk suffers when running multiple apps in parallel. As their name suggests, these drives have no moving parts, since they store data on non-volatile NAND flash chips rather than spinning magnetised disks. As such,

SSDs make no noise and can be much faster than a hard disk.

Although, like any new technology, it's taken a while for the SSD market to take off, this year has seen fantastic progress. Market leaders such as OCZ have been releasing new drives practically every month, thanks to a deluge of new controller chips from companies such as Samsung and Indilinx. As a result data transfer rates are close to double what they were this time last year, while the price per gigabyte of a typical SSD has dropped by nearly 50 per cent.

Due to this rapid development, we've rounded up a bunch of the most interesting SSDs and put them through their paces in a variety of real-world and synthetic performance tests. Read on to find out how to boost your PC's performance without making an audible impact on noise.

HOW WE TESTED

While an SSD (solid-state drive) works in a completely different way to a HDD (hard disk drive), it performs exactly the same function, which is to store data. For this reason we began by testing every SSD, measuring how fast data can be read from and written to the device. First of all, we used Simpli Software HD Tach 3 RW (www.simplissoftware.com), which runs a series of tests to record sustained throughput when reading and writing, plus the average access time and burst transfer rate.

These tests exposed one of the great advantages SSDs, which is that hard disk drives perform worse when data is being read/written to the inner zones of its platters compared to outer zones, as the outer sections (which have longer tracks) contain more sectors per track. However, the read and write performance of an SSD is identical, regardless of whether it's accessing data from its first or last gigabyte.

However, these tests also revealed the Achilles heel of flash memory, which is that it's much slower at writing data than reading data. This means that, while a flash memory-based SSD may be faster than a hard disk at read-intensive tasks, it may be slower when it comes to write-intensive applications.

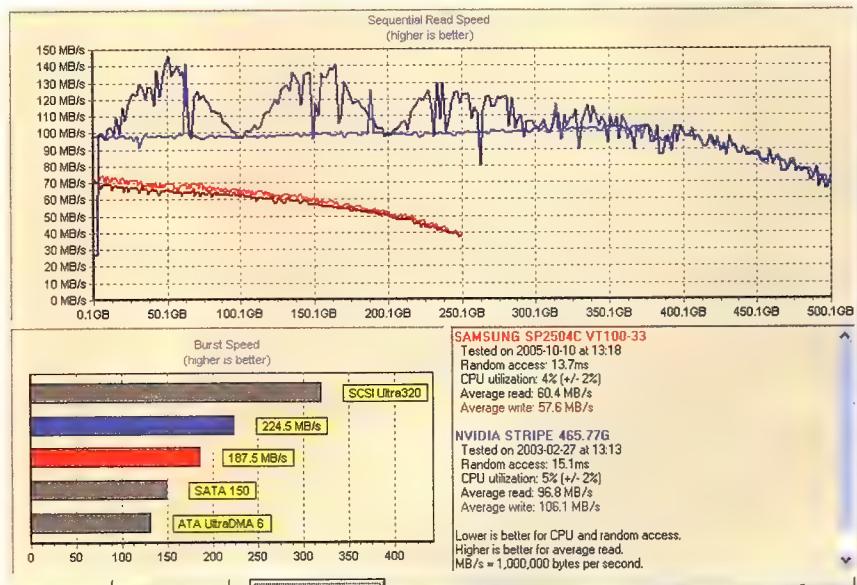
However, an SSD's performance in real-world applications is affected by other factors too, such as the memory buffer size, not to mention the algorithms used to calculate which data to store in the buffer and which to discard. It's for this reason that we also tested the SSDs with some additional mainstream tests which are based on the kinds of tasks that you're likely to perform with your PC.

The first additional test was FC-Test by www.xbitlabs.com. This test measures the speed at which a drive can write, copy and read data using two different profiles. The first profile comprises 270 small MP3 files totalling 0.99GB while the second comprises a three large ISO DVD images totalling 1.6GB. We use these two profiles as it places the drives under a different type of strain, and will therefore reveal any weaknesses in the controller or firmware.

We also tested all the drives using iometer (www.iometer.org), a powerful open-source benchmarking



Crysis not only gives your CPU and graphics card a good workout, but is also very drive-intensive



iometer is a powerful open-source utility for benchmarking drives and storage arrays.

SSD Specifications

	Corsair P128	Corsair P256	Corsair X128	G.Skill Falcon 128GB	Kingston M Series 80GB	Kingston V Series 64GB
Capacity	128GB	256GB	128GB	128GB	80GB	64GB
Street Price	\$440	\$922	\$459	\$429	\$359	\$179
Price per GB	3.44	3.6	3.59	3.35	4.49	2.8
Supplier	Corsair	Corsair	Corsair	G.Skill	Kingston	Kingston
Website	www.corsair.com	www.corsair.com	www.corsair.com	www.gskill.com	www.kingston.com	www.kingston.com
Controller	Samsung	Samsung	Indilinx IDX110M00	Indilinx IDX110M00	Intel	Toshiba
Buffer size	128MB	128MB	64MB	64MB	16MB	N/A

utility. Our custom script uses a 4GB portion of the drive and subjects it to random read or write 4KB commands, then a combination of the two with three demanding I/Os to simulate high-level multi-tasking. We ran each test for two minutes, repeating three times to ensure we recorded an accurate result.

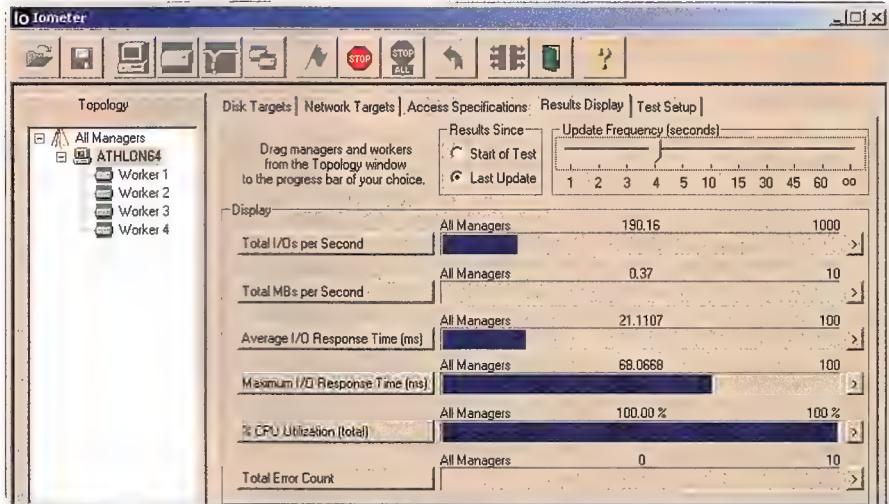
To determine if an SSD can improve your gaming experience, we also timed how long each drive took to load the Core level from 64-bit Crysis in DirectX 10 at 1280x1024. Finally, we timed how long each SSD took to load Windows. The boot time was measured between the first appearance of the BIOS splash screen and the Welcome Centre appearing on the Windows desktop.

All the SSDs were tested in the same PC, which consists of an Intel Core 2 Duo E6850 CPU installed in a GIGABYTE GA-X38-DS5 motherboard based on the Intel X38 chipset and ICH9R Southbridge.

The system also includes 2GB of OCZ FlexXL PC-6400 RAM operating in dual-channel mode at 800MHz with 5-5-5-15-2T timings. All tests were carried out using Windows Vista SP1 with an ATI 4850 512MB.

To make it easier to put the performance of SSDs into perspective we also added the benchmark results for several high-performance hard disks to our graphs. These are the 2.5in 300GB Western Digital VelociRaptor and the 3.5in 1TB Samsung SpinPoint F1 HD103UJ, two great representatives for the hard drive sector.

The overall Speed score is based on a weighted combination of all the different real-world and synthetic performance tests except HD Tach 3 RW. This is because HD Tach 3 RW was written to test hard disks, not SSDs, so sometimes it doesn't accurately measure SSD performance. Unlike hard disks we've included a separate Features score for each SSD; as the different memory types, interfaces, form factors, warranties and error correction technology are all important considerations. The Value score is then calculated by dividing the Speed and Features score and capacity by its price. The Overall score is the sum of these scores.



HD Tach doesn't accurately measure the performance of all SSDs, but it's still useful for showing the difference between an HDD and an SSD.



Kingston V+ Series 64GB	OCZ Agility 120GB	OCZ Summit 120GB	OCZ Vertex 120GB	OCZ Vertex EX 120GB	OCZ Vertex Turbo 120GB	Patriot Torqx 128GB
64GB	120GB	120GB	120GB	120GB	128GB	128GB
\$289	\$475	\$560	\$549	\$1,781	\$609	\$566
4.52	3.96	4.67	4.58	14.84	5.075	4.42
Kingston	OCZ	OCZ	OCZ	OCZ	OCZ	Patriot
www.kingston.com	www.ocztechnology.com	www.patriotmemory.com				
Samsung	Indilinx IDX110M00	Samsung	Indilinx IDX110M00	Indilinx IDX110M00	Indilinx IDX110M00	Indilinx IDX110M00
N/A	64MB	128MB	64MB	64MB	64MB	64MB

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KITLOG

Issue 1, October 2009

atomic



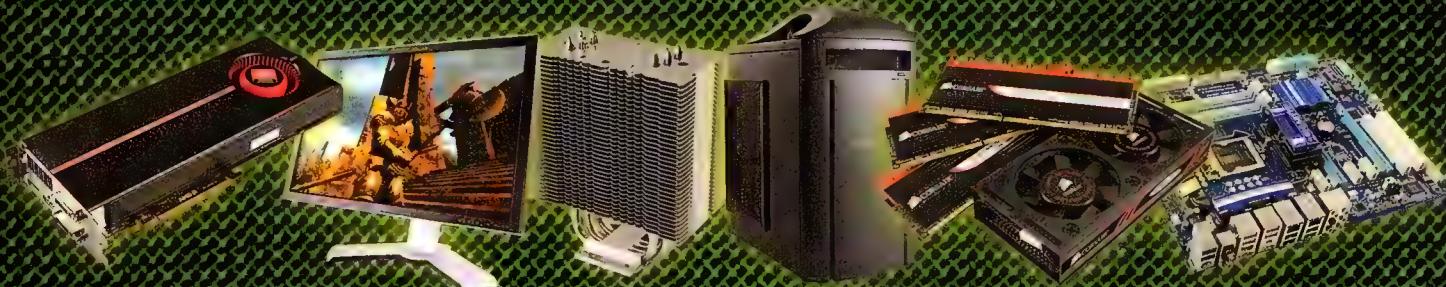
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Corsair P128

Decent value, but with formatting issues.

Street Price \$440 Price per GB 3.44
Supplier Corsair

The Corsair P128 is a 128GB version of Corsair's P256 SSD that is built around the same Samsung ARM drive controller, and the same Samsung MLC NAND flash. This means that it benefits from very similar performance in comparison to its bigger sibling, with particularly good sequential write and copy speeds, thanks to the presence of a large 128MB cache. The drive is equally capable when reading sequential batches of files, taking just 3.4 seconds to read our 0.99GB MP3 file pattern and 8.1 seconds to read our 1.6GB ISO in FC-Test.

Performance isn't great in lometer, though, with the Samsung drive controller only delivering a random write speed of 3.82MB/sec in comparison to the 9.5MB/sec or greater of drives using the competing Indilinx controller. However the P128 is still four times faster than a hard drive, and the P128's average and maximum write latencies are pleasingly low, so it won't suffer from any kind of stuttering. Real-world

speeds are very nippy, with a Vista boot time of 25 seconds, slightly slower than that of the P256, and a Crysis load time of 28 seconds.

However, the drive suffers from a significant bug if you perform a full format in Vista (quick formatting is fine), performance is massively crippled until you perform a secure hard drive erase using a DOS-based application such as HDerase, an issue to which Corsair and Samsung have been alerted of but has yet to be fixed.

While the drive ships with a simple garbage collection algorithm to sustain performance over extended periods of use, we found it to be unreliable, and even when left overnight, it had only a very marginal effect on the drive's performance. There have also been no incremental firmware updates to improve drive performance, garbage collection or to add Trim support since the drive's original release, whereas Indilinx has released numerous updates for drives using its controllers.



The P128 might have attractive performance out of the box and its price might undercut some similar-capacity Indilinx-based drives, the lack of support from Corsair and Samsung make it much less attractive. HB



The P256 uses a Samsung ARM processor drive controller and Samsung MLC NAND flash, along with 128MB of cache to offer some very impressive performance figures.

Sequential write and copy speeds are the drive's speciality; it wrote the FC-Test 0.99GB MP3 file pattern in a nippy 6.5 seconds and copied the same files in 5.3 seconds. It was just as strong dealing with the larger files of the ISO file pattern, with write and copy times of 11.25 and 11.34 seconds respectively.

Read speeds are good too, although a little slower than the Indilinx-based drives

when dealing with the larger ISO file pattern.

This translates into a Vista boot time of just 24 seconds and a Crysis level load time of 28 seconds, both of which are huge improvements over a hard disk and very competitive in comparison to the other SSDs on test.

Random performance is less impressive – the P256 only delivers 4.74MB/sec random write speeds in comparison to the 9.5MB/sec or greater of the Indilinx-based SSDs. However, this is still four times faster than the Samsung 1TB HDD, while the low average and maximum read and write latencies show that the drive will be stutter-free and provide the snappy responsiveness of other high-end SSDs.

Sadly the P256 is let down by the lack of support. While Corsair offers a five-year warranty, the P256 ships with a serious bug that cripples the drive's performance if it's fully formatted in

Corsair P256

Large capacity, but still buggy.

Street Price \$922 Price per GB 3.6
Supplier Corsair

Vista; this is only rectifiable by a full secure erasure of the drive using a DOS-based application such as HDerase, same as with the P128.

There's also no sign of any new firmware or TRIM support, and while the drive ships with a basic garbage collection algorithm to restore drive performance while idle, it's ineffective and needs improving. HB



Corsair X128

Zippy performance, great value Indilinx drive.

Street Price \$459 Price per GB 3.59
Supplier Corsair

Unlike the Corsair P128 and P256, which have firmware issues that lead to massive performance degradation if you fully format them, the X128 avoids this with an Indilinx controller rather than a Samsung controller.

The X128 ships with version 1571 firmware, which is the latest official version, although OCZ drive owners have access to more advanced beta versions. It also lacks garbage collection but has a TRIM function in the form of wiper.exe, although this only works with Windows 7.

As hinted at in its name, the X128 is a 128GB drive, so it should be large enough for Windows and a few games and applications, especially when you consider that SSDs don't slow down anywhere near as much as hard drives as you fill them up.

Having exchanged broadsides with the

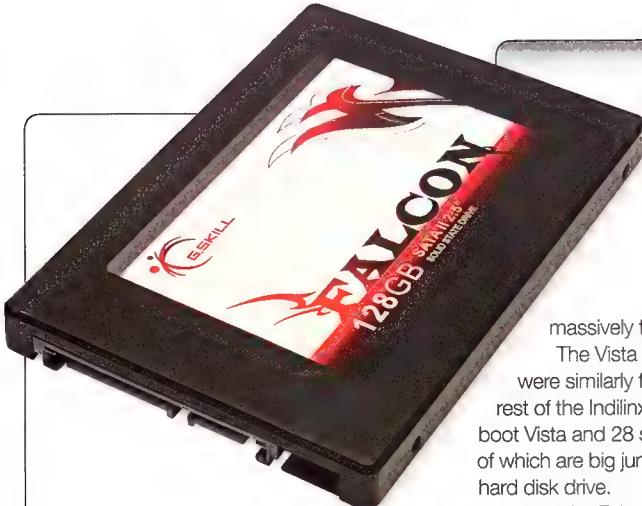
rest of samples this month, the X128 performed very well and was slightly faster in some tests than other Indilinx drives we looked at.

In the MP3 pattern in FC-Test, for example, the X128 was slightly ahead of the G.Skill Falcon in the copy to drive test, where the X128 managed the task in 5.9 seconds while the Falcon took 6.2 seconds. It was slightly slower in the MP3 create test, but only by two hundredths of a second. All of the Indilinx drives are light years ahead of both hard drives. For example, the Western Digital VelociRaptor took 55 seconds to boot into Vista while the X128 managed the same task in a blistering 25 seconds. The Crysis load test also favoured the X128, which had the game up and running in 28 seconds while, the VelociRaptor took 35 seconds.  AL



Overall
Performance is grand for the price.

85%



Like many SSDs the G.Skill Falcon uses the proven Indilinx IDX110M00 controller, to the point that apart from the branding sticker and the packaging there's almost nothing to differentiate it from the OCZ or Torqx offerings.

However, the use of the Indilinx drive controller is no bad thing, as it delivers superb performance across varied workloads. Sequential write, copy and read speeds are uniformly excellent, with especially impressive read speeds of 3.7 and 7.4 seconds in the FC-Test read MP3 and ISO file patterns, translating to 270MB/sec and 216MB/sec,

massively faster than any hard disk.

The Vista boot and Crysis load times were similarly fast with the Falcon, like the rest of the Indilinx drives, taking 25 seconds to boot Vista and 28 seconds to load Crysis, both of which are big jumps in speed compared to a hard disk drive.

Due to the Falcon's use of an Indilinx drive controller, it also benefits from reassuring after-sales support. There has been multiple firmware releases through G.Skill's support forum since the drive was first released, with native TRIM support and a garbage collection algorithm currently in public beta testing if you flash it with the firmware of an OCZ Vertex. G.Skill also provides wiper.exe, a program that helps to restore performance until the drive can do it automatically.

However, the Falcon's firmware update process completely erases all data on the drive, which is a major inconvenience. You'll need to image the drive to a spare hard disk or SSD,

G.Skill Falcon

A seriously awkward flasher.

Street Price \$429 Price per GB 3.35
Supplier G.Skill

flash the firmware from within a separate Windows install, and then image your data back onto the Falcon. In comparison, OCZ and Crucial's firmware updates are easily run from a DOS-based executable and will leave your data intact.

With that in mind, the G.Skill Falcon, while a fine SSD, has to lose out to its more upgrade-friendly competitors. While it delivers great performance at a competitive price, keeping it up to date is just too much hassle.  HB

Overall
Decent value, more issues.

72%

Kingston M Series 80GB

Luxury price, average performance.

Street Price \$359 Price per GB 4.49
Supplier Kingston

The M series represents Kingston's top-end SSD, but it seems as though Kingston has come to the SSD party a little late and is dressed in last year's fashions. The M Series is a rebranded Intel X25-M 80GB, the same drive that we first looked at last year. Against the new crop of drives however, it's starting to show its age.

With a quoted write speed of just 70MB/sec, the M Series struggles to keep up with the newer generation of drives, taking 12.1 seconds to write our MP3 file pattern and over 21 seconds to write our ISO file pattern, with speeds of 83MB/sec and 73MB/sec respectively.

However, the M Series boasts extraordinary random write performance; at 45.7MB/sec out of the box, this is even better than the SLC NAND-equipped OCZ Vertex EX. Sadly, we found this stellar performance rapidly deteriorated when repeating lometer runs, to the tune of 50 per cent for every additional time we ran the test.

Random write latencies aren't perfect either, and while the average write latency of just 0.25ms is the lowest any drive we've tested, the maximum write latency was almost a second. While this will be a rare occurrence, and will be probably undetectable in normal use, it's still significantly more than the maximum latencies displayed by the Samsung and Indilinx drives.

The M Series didn't fare well in the real-world tests either, taking 30 seconds to boot Vista and the same time to load Crysis. While the Crysis time is only a couple of seconds slower than the other drives on test, loading Vista takes a full five or six seconds longer than on the much cheaper Indilinx and Samsung-based drives.

The Intel drive controller at the heart of the M Series hasn't received the best support since its release either. There's currently no sign of support for TRIM in Windows 7, and drive speeds can degrade significantly overtime with



no garbage collection to restore performance.

While the price tag of only \$359 might look reasonable, remember that this is only an 80GB drive (before formatting). 



60%



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Kingston V Series 64GB

So slow that it makes hard disks look fast.

Street Price \$179 Price per GB 2.8
Supplier Kingston

Kingston might be a major player in the RAM market, but its SSDs have yet to make a significant impact. However, the V Series has one headline-grabbing feature – you can pick up this 64GB SSD for just \$179.

Unlike most of the other SSDs in this Labs test, the V Series uses Toshiba MLC NAND flash coupled with a Toshiba TC58NCF602GAT controller. We hadn't heard of this controller before, but after some digging around we found out that it's based on the 15-month old infamous JMicron JMF602. This cache-less controller nearly proved to be the undoing of the SSD revolution, as it has very poor latency; SSDs using it pause and stutter for several seconds at a time when writing. A bold choice then, even for a budget SSD such as the V Series.

Although the V Series booted Vista in a reasonable 30 seconds, it proved appallingly slow in every other test. In lometer, for example, it could only randomly write at 0.05MB/sec – 65 times slower than the next

fastest SSD and 20 times slower than a Samsung F1 hard disk. The V Series is much better at reading, but in the FC-Test benchmarks, it was still on average two to three times slower than most of the other SSDs in this Labs test.

The final nail in the coffin of the V Series is latency. Toshiba might have stuck its name on top of the controller, but it still exhibits a ridiculous amount of write latency – as much as 1,615 milliseconds – a ludicrous 16 seconds. In contrast, even the sluggish Intel drives manage a latency of less than 300 milliseconds, while other drives typically clock in at around ten milliseconds. Once again, the Samsung F1 hard disk was faster, with a maximum random write latency of 33.31 milliseconds.

Although you'd struggle to run a desktop PC with a 64GB SSD for long, this capacity should be sufficient for some laptops. However, as the V Series is burdened– or crippled - by a ridiculous



amount of latency when writing, it isn't worth buying at any price. Kingston, Toshiba and JMicron should be ashamed of this frankly appalling drive. **JG**

Overall
Everything wrong with an SSD makes a showing here.

35%



We were initially worried that the Samsung controller in the Kingston V+ series was the same as that in the Corsair P-series drives. These have been found to have issues when full-formatting the drive in Windows Vista, greatly reducing their performance unless you use a low-level formatting program to get it working.

Luckily, the V+ series uses a Samsung S3C29RBB controller, which is different to that of the Corsair P-series drives, so you can format this drive without worrying about its performance being crippled.

The nearest competitor to the V+ Series is the earlier V Series, also from Kingston. However, while the V Series is rated as being capable of reading at up to 100MB/sec and writing at up to 80MB/sec, the V+ Series is rated at 220 and 140MB/sec respectively. These figures translated into a huge difference in our tests, with the V+ Series drive consistently outperforming the dire V Series (though that's not saying much). According to lometer, the V+ Series can randomly write at 3.25MB/sec, while the V Series struggles along at 0.05MB/sec.

However, the V+ Series wasn't quite able to keep up with the Indilinx controller-based drives that can write at close to 10MB/sec under the same conditions. There was little difference in the Crysis level load times or Vista boot times, with just one or two seconds between the V+ Series and the Indilinx-based drives. Even though it was slightly slower in some of the tests, the V+ Series is still much faster than a hard drive.

Kingston V+ Series 64GB

Comes with plus-sized price tag.

Street Price \$289 Price per GB 4.52
Supplier Kingston

Unfortunately, the V+ Series is only available in a capacity of 64GB, so it's of limited use for a desktop PC – an additional 64GB will almost certainly be needed for the comfortable installation of Windows and essential programs. This is a shame; while it's slightly slower than the Indilinx-based drives, the V+ Series has the potential to compete on price.

If you have a relatively powerful laptop and can get away with having just 64GB of storage, the V+ Series could give it a new lease of life. **AL**

Overall
A good drive, but very expensive.

72%

OCZ Agility 120GB

Mean in green.

Street Price \$475 Price per GB 3.96
Supplier OCZ

Having ditched the stuttering JMicron series of controllers from its SSD line-up, OCZ now appears determined to use the excellent Indilinx IDX110M00 controller in as many of its SSDs as possible.

Despite having the same controller and 64MB of cache as all other current OCZ drives, the Agility is considerably cheaper. This is possible because, unlike the Vertex-series drives, Agility's are made from cheaper MLC NAND flash chips from a variety of manufacturers such as Samsung and Intel. As a result, the 120GB Agility has slower read and write speeds than the Vertex; 230 and 135MB/sec compared to 250 and 180MB/sec respectively.

On paper, the Agility is slower than the Vertex but our tests proved that the Agility is actually a smidgen faster. It depends on the test being carried out, however. For example, the Vertex has slightly lower latency than the Agility. In contrast, once the Agility starts

reading or writing, it's faster than the Vertex.

The Agility finished writing the ISO files in FC-Test in just 11.248 seconds, while the Vertex took 13.307 seconds.

The Agility was also slightly faster at copying the same files within itself, taking 13.127 seconds compared to the Vertex's 13.72 seconds. Both drives took the same impressively low time to load Crysis and boot Vista.

From its performance numbers alone, it looks like the Agility should be an absolute bargain, as it's slightly faster than the \$75 more expensive Vertex. However, we have one major concern about the Agility – its multiple source NAND flash chips. Our sample, for example, was built with Intel chips, but there's nothing to say that the drive you buy will have Samsung chips, so it may perform very differently.

As such, unless OCZ starts to publish exactly which flash chips each Agility drive is made from,



we reckon that the slightly more expensive but also more consistent Vertex makes a better choice. JG



OCZ Summit 120GB

Reaching high.

Street Price \$550 Price per GB 4.67
Supplier OCZ

We were initially worried that the Samsung controller in the Kingston V+ series was the same as that in the Corsair P-series drives. These have been found to have issues when full-formatting the drive in Windows Vista, greatly reducing their performance unless you use a low-level formatting program to get it working.

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Unfortunately, the V+ Series is only available in a capacity of 64GB, so it's of limited use for a desktop PC – an additional 64GB will almost certainly be needed for the comfortable installation of Windows and essential programs. This is a shame; while it's slightly slower than the Indilinx-based drives, the V+ Series has the potential to compete on price.

If you have a relatively powerful laptop and can get away with having just 64GB of storage, the V+ Series could give it a new lease of life. AL



Keeping your SSD TRIM

SSDs can have a huge impact on your everyday PC use, be it reducing system boot time and application start-ups, or giving a generally more responsive and smoother experience. However, with heavy use the performance of MLC NAND flash SSDs can degrade over time, as the cells of data on the drive become partially filled with deleted files.

Using these cells again requires the drive to offload the data that's still needed to the cache before rewriting it elsewhere. This results in a read/erase/modify/write process that takes much longer than a simple write command to an empty cell. This compromises performance, sometimes to a significant degree.

While some drives boast garbage collection or self-healing algorithms to reverse this performance degradation, and Windows 7 promises the TRIM command that automatically clears out deleted files from partially filled cells, the best way to avoid problems is to minimise your operating system's abuse of your drive. Windows Vista, for example, was specifically written to make continuous use of the hard drive, be it background defragmentation, pre-fetching frequently used files into the system's page file or continually re-indexing files. With an SSD, these features are rendered mostly useless due to the greatly improved read and response times, and leaving them enabled will actually compromise your SSD's performance over time.

The first thing you should do is make sure any form of disk defragmentation is disabled. Right click the drive in My Computer and browse to Properties > Tools > Defragmentation and make sure that defragmentation is set to Never for your drive. As access times for any part of an SSD are the same, they don't suffer from defragmentation in the same way as hard disk drives, although Vista won't recognise this. Leaving it enabled means that your system

will spend time pointlessly moving files around the SSD, thereby degrading performance.

In a similar vein, if your PC has 4GB or more of RAM, it's advisable to disable your OS using a page file (also known as virtual memory) on your SSD. This is another useful feature when it comes to mechanical disk drives, but the constant write and rewrite commands will severely hurt the performance of your SSD. To disable the page file, right click My Computer and browse to Properties > Advanced System Settings > Advanced > Performance > Settings > Advanced > Change and set it so that your SSD is listed as having 'No paging file'.

Bear in mind, however, that some recent games, such as Arma II and Dawn of War 2 have been specifically coded to make use of virtual memory and may not work properly without a page file. While most games will still work perfectly, you can set a page file to operate on any hard disk drive you have installed in your system to ensure compatibility, without thrashing your SSD.

It's also worth disabling Vista's SuperFetch service, which pre-loads frequently used applications into your system's memory ready for speedier launching. While this process doesn't spank your SSD in the way defragging or the page file will, it's rendered worthless by an SSD's near-instant response times and increased speeds. Disable this by browsing to the Services menu and disabling Superfetch at start-up.

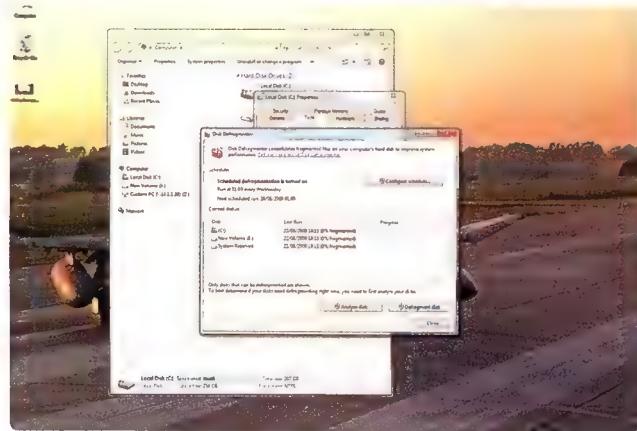
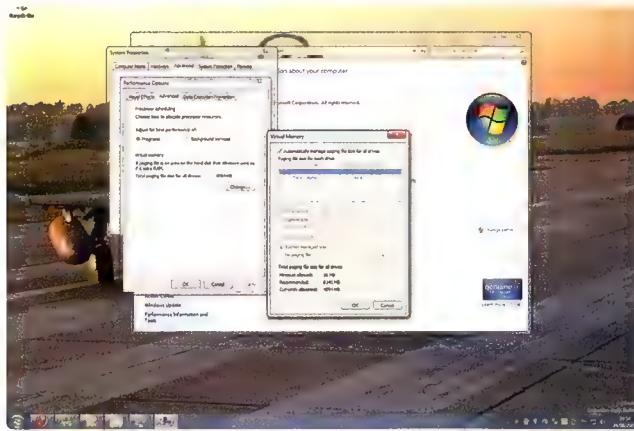
Some people argue that it's also worth disabling drive indexing on your SSD to prevent Windows accessing the drive in the background, although we've found that this process has only a very small impact on drive performance, and the benefits of having it enabled far outweigh the tiny drive usage.

As SSD performance degradation often occurs following extended periods of multiple writes, installing an operating system and the numerous service and security updates, as well as programs and drivers involved therein, can really impact an SSD's performance. To avoid

this happening, it's worth looking into drive-imaging software such as Acronis TrueImage (www.acronis.com) and installing your OS onto a separate drive before imaging onto your SSD. The imaging process acts as one single continuous write process instead of numerous small ones, and minimises the cell fragmentation that can decrease performance. This software is also invaluable for creating exact backups of your drive if you plan to regularly update your SSD's firmware.

If you've had an SSD running with all these services for a while, however, it's likely that you're already a victim of performance degradation. While some Indilinx-based drives support an effective garbage collection algorithm to restore performance, the most reliable way to restore an SSD to its original speeds is to perform a secure erase of the drive, for which we recommend using DOS-based app HDerase (<http://tinyurl.com/2x0qqw>). Using a bootable flash drive, it's a simple application, but be aware that, as it was originally developed for the NSA, once run on any disk drive the data deleted is totally irrevocable, so don't use it lightly! By combining an imaged backup of your heavily used SSD and a secure HDerase wipe of the SSD, it's quite possible to recover a significant amount of drive performance, even on a well-used drive.

Also of interest is the fact that despite Windows 7's much talked-about support for SSDs, we've yet to see an SSD bearing any kind of 'works with Windows 7' logo. We've deduced that this is due to Microsoft insisting that SSDs must show no sign of performance degradation, even when filled to 100 per cent of their capacity – which is quite a caveat for manufacturer to deal with. While no SSD currently on sale is able to make such a claim, our impressions of Indilinx's new garbage collection algorithm indicates that we're not too far from seeing a performance degradation-free drive.  HB



OCZ Vertex 120GB

Black and white is the new black.

Street Price \$549 Price per GB 4.58
Supplier OCZ

The OCZ Vertex was the first SSD using the Indilinx IDX110M00 controller that we looked at and we're as impressed now as we were then with it.

Underneath the unassuming black casing are the same doodads as found in any other of the Indilinx drives included in this month's Labs test. There are 16 8GB Samsung MLC NAND flash chips that combine to provide 120GB of storage plus a 64MB Elpida SDRAM cache chip.

The result, as with all the Indilinx drives in this month's Labs test, is a scintillatingly fast SSD that's much faster than a hard drive on every level. Sequential speeds are excellent, with write times of 6.56 seconds and 13.307 seconds for the FC-Test MP3 and ISO file patterns translating to 152MB/sec and 120MB/sec. While these aren't quite up to the quoted 180MB/s, they're big improvements over hard drives.

Read speeds are equally good, with the drive delivering 265MB/sec as it read our MP3 file pattern in 3.77 seconds, and 216MB/sec when tasked with the larger 1.6GB ISO file pattern. These speeds are close to the quoted peak read speed of

250MB/s and show that you're getting a drive that's much faster than a hard disk.

Following stuttering issues with past drives, whereby SSDs would seem to hang for seconds, OCZ requested that Indilinx heavily optimise the IDX110M00 controller for random write as well as random read, with the result that the Vertex is superb when tasked with even the most demanding of random write patterns.

Our Iometer test produced a random write speed of 9.63MB/sec, almost ten times that of a hard disk, with average and write latencies of 1.3ms and 10.46ms respectively. Random read speeds are excellent too; even bombarding the drive with an ultra-high workload of random read and write commands doesn't catch out the Indilinx controller. This means that the Vertex, like all Indilinx drives, is stutter-free, making it ideal for installing your operating system on.

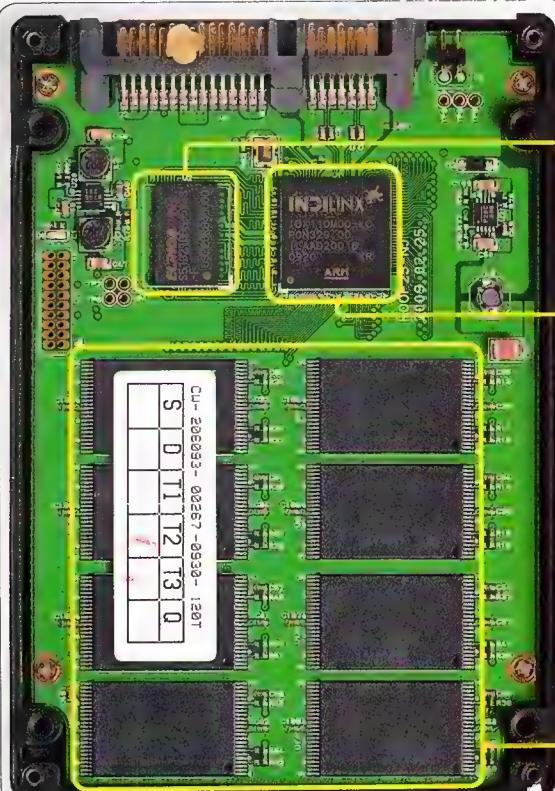
Real-world performance is impressive as well, with the Vertex booting Vista 64 in just 25 seconds and loading our Crysis level in

28 seconds. In comparison, the Samsung F1 hard disk drive takes 60 seconds and 37 seconds respectively to accomplish the same tasks. The Vertex's 0.1ms response time and blistering read/write speeds also make opening applications, browsing files and installing updates and patches much faster – using an operating system installed on an SSD feels much more responsive.

While the Vertex's performance is very good, it's practically identical to that of any SSD built using the Indilinx IDX110M00 controller. The difference are in the degree of after-sales support, for which OCZ has established itself as an industry leader. Multiple firmware updates and the release of wiper.exe, an application that helps to restore performance, has now led to OCZ offering its users the chance to beta-test the latest Indilinx firmware, with support for TRIM in Windows 7 and an effective OS-independent garbage collection algorithm.

OCZ has also made its own proprietary DOS-based firmware update app that doesn't require you to fit a jumper, or erase the contents of your drive when updating.

Add to this excellent support and performance, and the three-year warranty, and the Vertex fully deserves its rep. However, at \$549 the Vertex is a good \$74 more expensive than the OCZ Agility, a drive that offers similar performance out of the box and that in time will receive identical firmware updates. If you must have the most absolute best performance then the Vertex is the drive for you, but otherwise, the Agility makes more sense.  HB



Like all Indilinx-based drives, the Vertex has 64MB of cache memory.

The OCZ Vertex was the first SSD to use the awesome Indilinx IDX110M00 controller.

Like many other cost-effective SSDs, the Vertex uses Samsung MLC NAND flash chips.

OCZ Vertex EX 120GB

Lightning fast, but insanely expensive.

Street Price \$1781 Price per GB 14.84
Supplier OCZ

Once upon a time all flash drives sported SLC NAND flash, but then along came MLC NAND flash, which produced broadly similar performance at a fraction of the price. Not many companies bother making SLC drives these days; as a case in point, the OCZ Vertex EX costs \$1,781 in its 120GB incarnation – that's an eye-watering \$14.84 per gigabyte, more than triple the cost of a typical MLC drive. It's fair to say, therefore, that without the switch to MLC NAND flash, the SSD revolution would never have gained much momentum.

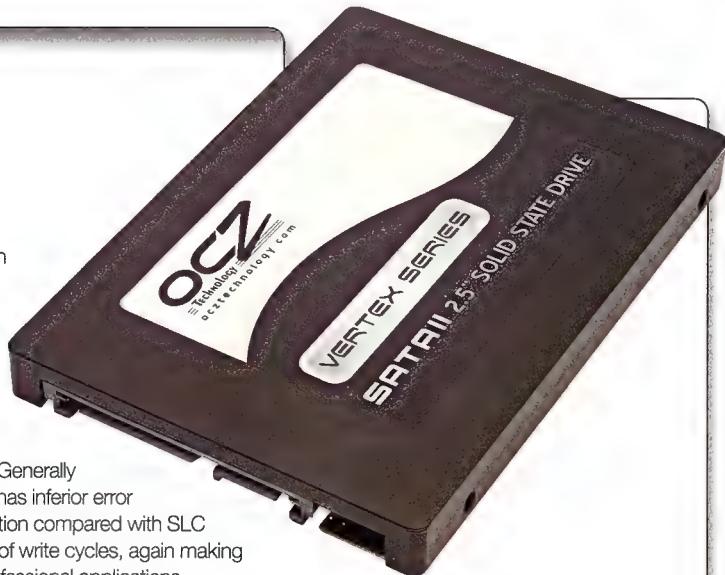
Interestingly, the Vertex EX shares the same Indilinx IDX110M00 controller and 64MB of cache as the other Vertex drives. This means it has the same advantage of user-flashable firmware, allowing you to upgrade the Vertex EX as and when new features are added.

However, while MLC NAND flash offers broadly similar performance to SLC NAND flash, SLC still has a number of advantages due to the different way it stores data. While SLC NAND flash can only store one bit per cell, each MLC cell can store multiple bits per cell, which means that it can store more data per square millimetre, thus keeping manufacturing costs low. However, this means that MLC cells

are much slower than SLC cells at writing, especially when the drive is tasked with writing lots of random data, such as when attached to a server running a database. Generally speaking, MLC also has inferior error detection and correction compared with SLC and a lower number of write cycles, again making it less suitable for professional applications.

HD Tach, which only measures average transfer rates, was unable to see the benefit of the SLC NAND flash in the Vertex EX. It reckons that the Vertex EX can read at 238.4MB/sec and write at 172.9MB/sec; this is similar to the far cheaper MLC-equipped OCZ Vertex, which reads at 239.3MB/sec and writes at 161.2MB/sec.

In contrast, the Vertex EX wrote the MP3 files in FC-Test at a startling 182MB/sec, while the Vertex struggled along at a far slower 152MB/sec. The difference was even more pronounced when writing the ISO files in FC-Test, with the Vertex EX writing at 175.8MB/sec compared to just 120MB/sec for the Vertex.

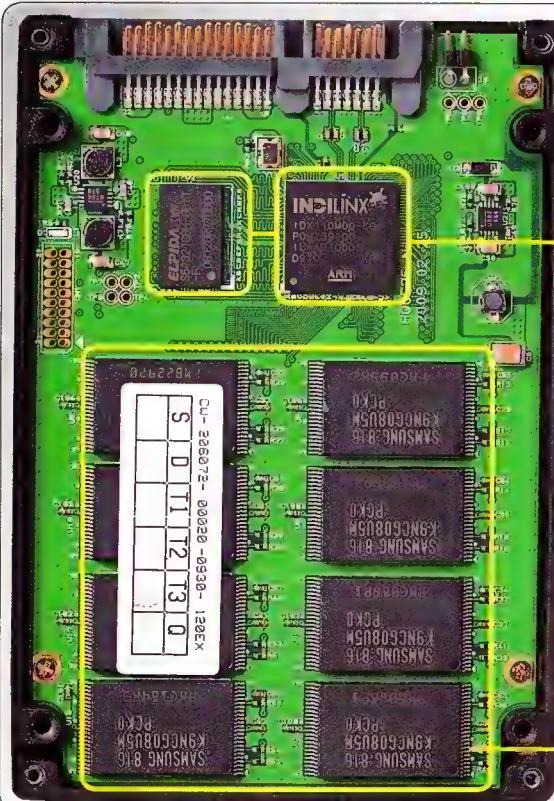


The random file test patterns of lometer also highlighted the excellent write performance of SLC memory, with the Vertex EX averaging 31.34MB/sec, more than three times faster than the Vertex, which wrote at 9.63MB/sec. Admittedly, the Intel MLC drives write at nearly the same speed as the Vertex EX, but they have much greater latency and suffer from extreme performance degradation over time.

SLC memory is also very fast at writing; according to lometer, the Vertex EX randomly reads at 40.31MB/sec compared to 31.01MB/sec for the Vertex. This means the Vertex EX has a combined read and write transfer rate between three and ten times faster than a typical MLC drive, making its price premium over a typical drive not too outrageous. You'd typically have to pay four times the price to double your grunt when upgrading your CPU.

The only setup that can hope to compete with the Vertex EX are PCIe-based solid state technologies, although those drives have a much faster theoretical write speed – 412.8MB/sec according to HD Tach – they're typically slower than the Vertex EX in the random read/write tests, being constructed of four MLC drives linked together in RAID 0. This also means that the Vertex EX has superior ECC and a larger number of write cycles than these PCIe technologies.

Although we wouldn't recommend a Vertex EX to gamers, its stunning random read/write performance and superior data integrity makes it perfect for a server that needs to supply a lot of data to other systems. **JG**



As with all the best flash drives, the heart of the Vertex EX is this Indilinx controller and 64MB cache chip.

Unlike all the other flash drives in this Labs test, the Vertex EX employs SLC rather than MLC NAND flash.

Overall
Phenomenal write performance, but out of reach for anyone not running a server.

70%

OCZ Vertex Turbo 120GB

First overclocked SSD?

Street Price \$609 Price per GB 5.08
Supplier OCZ

The joke going around the Labs recently has been that OCZ has announced a new SSD practically every fortnight over the last year. The Vertex Turbo is one of the latest additions to the range and has more than a passing resemblance to the standard Vertex – in fact it's almost indistinguishable.

Like the Vertex, the Vertex Turbo sports an Indilinx IDX110M00 controller with 64MB of cache and 120GB of MLC NAND flash memory. However, OCZ has overclocked the host clock and cache in the Vertex Turbo from the 166MHz of the standard Vertex to 180MHz. OCZ charges you \$60 for the privilege, so the question has to be whether or not the overclock is worth the extra cash.

In a word: no. However, this isn't to say that the Vertex Turbo is a bad drive – after all, the standard Vertex is one of the best SSDs currently on the market. For example, OCZ claims that the Turbo can read and write at up

to 270MB/sec and 200MB/sec respectively. It didn't quite match those figures in our tests, but it managed an above average 32.9MB/sec random read in lometer and a random write speed of 10.09MB/sec.

However, despite its higher clock frequency, the Vertex Turbo was unable to significantly outpace the standard Vertex in our other tests. For example, both drives took the same amount of time to boot Windows and load Crysis, with 25 seconds and 28 seconds respectively. The reason for the Vertex Turbo's disappointing performance is its firmware, which lags behind that of the standard Vertex by a few weeks. This is because OCZ treats the Vertex as its flagship SSD, and therefore prioritises new firmware updates for this drive before its other drives.

Unfortunately, we find it impossible to recommend the Vertex Turbo, when for \$60



less you can buy a practically identically performing drive in the form of the Vertex.

JG



The Patriot Torqx is yet another SSD that features the Indilinx IDX110M00 controller. It has a capacity of 128GB, which should be enough for Windows and a fair number of games and other programs. The Torqx retails for \$566, which places it smack-bang in the middle of the Indilinx-equipped SSDs in terms of price per gigabyte.

Patriot adds some value to the above average pricing, though, as the Torqx has an exceedingly generous ten-year warranty. However this is of dubious value; due to their nature, any flash drive will be dead well within

this period.

As the Torqx sports an Indilinx controller, the firmware can be easily updated in the feature to support new features such as TRIM.

The Torqx performed almost identically to the other non-RAID Indilinx-equipped SSDs, such as the OCZ Vertex and G.Skill Falcon – all the drives managed to boot Vista in a pleasingly rapid 25 seconds. Needless to say, the Torqx was much faster than the Samsung F1 hard disk, loading Vista in less than half the time. This translates into a saving of nearly 20 minutes per month, assuming you boot your PC once a day.

One aspect that's impressed us with all the Indilinx-equipped SSDs is their random read and write performance. This is indicative of how well the drive copes with real-world tasks, especially those that read and write lots of small files.

For example, according to lometer, the Torqx

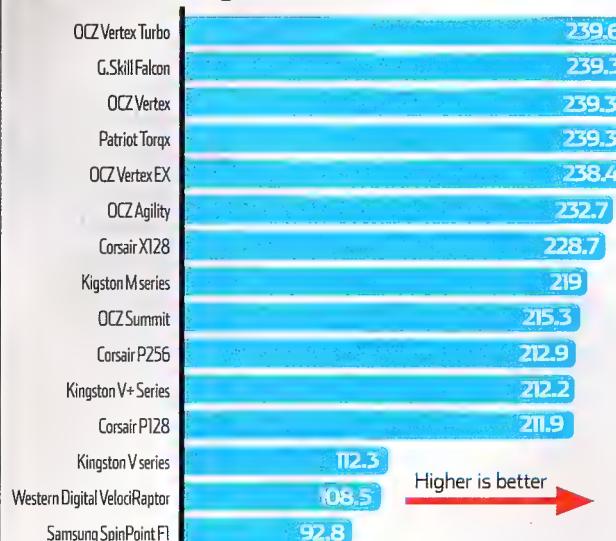
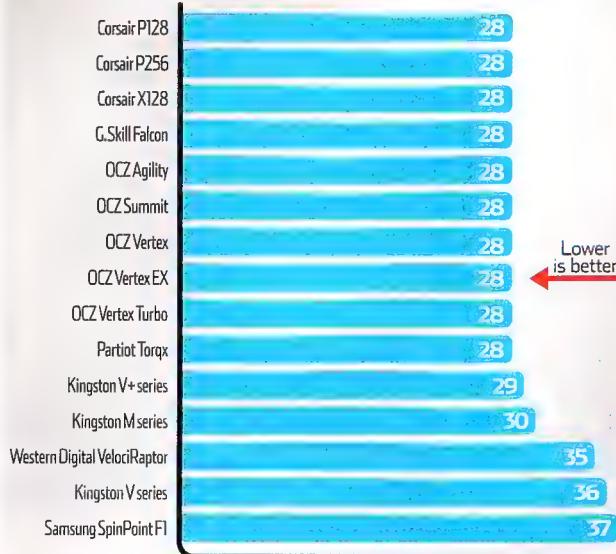
Patriot Torqx 128GB

Comes with a decade's worth of warranty.

Street Price \$566 Price per GB 4.42
Supplier Patriot

has a combined random read/write speed of 13.14MB/sec, compared to just 0.52MB/sec for the Samsung F1. The only SSD that is significantly faster is the far more expensive OCZ Vertex EX. However, although the Torqx is fast, it doesn't have any outstanding features. Given that it's slightly more expensive than the Vertex, it's a pretty solid choice for your SSD needs. AL



HD Tach average read**HD Tach average write****FC-TEst ISO copy****Windows Vista load****Crysis level loading****Iometer combined**

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IF A FRIEND TELLS YOU LIFE SUCKS
TELL THEM WHERE TO GO





Daniel Rutter loves microcontrollers – and Lego...

Back when the integrated circuit was young, it was a selling point to say that a gadget contained a 'silicon chip'. Nowadays, we're surprised if a car or telephone or microwave oven doesn't have a CPU.

The downside of this is that if something goes wrong with modern devices, you often can't fix them without buying a whole new circuit board, which for unusual or elderly appliances may be ridiculously expensive (don't even ask about cars).

The upside, though, is that even as the repairability and hackability of common household devices has been falling, the accessibility of computerised control systems for home hobbyists has been going up. This has opened up whole new vistas for the part-time hardware hacker.

Yes, you do have to do some actual programming to make a microcontroller do stuff, but there are some languages that work...

The CPUs in cars and appliances are usually integrated into a microcontroller (μ C, for short), a tiny little computer built into one chip. The simplest microcontrollers have the brainpower of a personal computer from 1980, but often rather less memory, because the programs they have to run are usually tiny. You don't need a million lines of code to run a dishwasher.

Several modern microcontrollers, though, have the CPU power of 1990 PC, or even a 2000 one. And it's not terribly hard to hook them up to, say, a Flash memory card, if you need bulk storage.

Actually, it's not hard to hook a modern microcontroller up to pretty much *anything*. Just look at blogs like Hack A Day or Make Online, where every second post seems to mention a microcontroller.

The μ Cs in these projects are 'single-board microcontrollers', little circuit boards that contain

a μ C and supporting components. They let you easily connect input and output devices, a power supply, and a data cable to load a program onto the μ C from a 'real' computer.

Yes, you do have to do some actual programming to make a microcontroller do stuff, but there are several easy-to-learn languages that work with one or more flavour of μ C. The good old 'BASIC Stamp' has a BASIC interpreter in ROM. There are other languages that're highly accessible to new μ C coders; look at 'Processing', for instance.

And you can even get point-and-click graphical-flowchart programming interfaces for microcontrollers, like for instance the PICAXE. If you're not into soldering, check out Lego's 'Mindstorms' gear! The basic Mindstorms

only actually need a few logic gates. Such projects can easily be assembled out of simple components, plus a couple of mechanical linkages.

But when you can buy a real computer with thousands, or millions, of transistors for pocket change, why not?

Sure, most of its capacity is wasted, but people across the world use computers the NSA would have killed for in 1980 to play Solitaire.

If you don't find this new Age of the Microcontroller Hobbyist rather exciting, I contend that your imagination may be defective. We are now, unexpectedly, living in an age when children can make autonomous robots.

I'm immensely excited to see what those kids make when they grow up.

(And also a little afraid.)

Are you ready to fear the next generation too?
dan@atomicmpc.com.au

programming interface is point-and-click, and there are numerous more powerful languages that work with it too. Third-party companies even make add-on sensors. So Lego is now a surprisingly complete robotics prototyping system.

It's been possible to do this sort of thing since the early personal-computer days – people hooked up many odd devices to their Apple II or Commodore 64, often via the parallel port. The difference, besides better entry-level programming languages, is that a computer able to do this stuff in the early 80s was really expensive. But single-board μ Cs are very cheap.

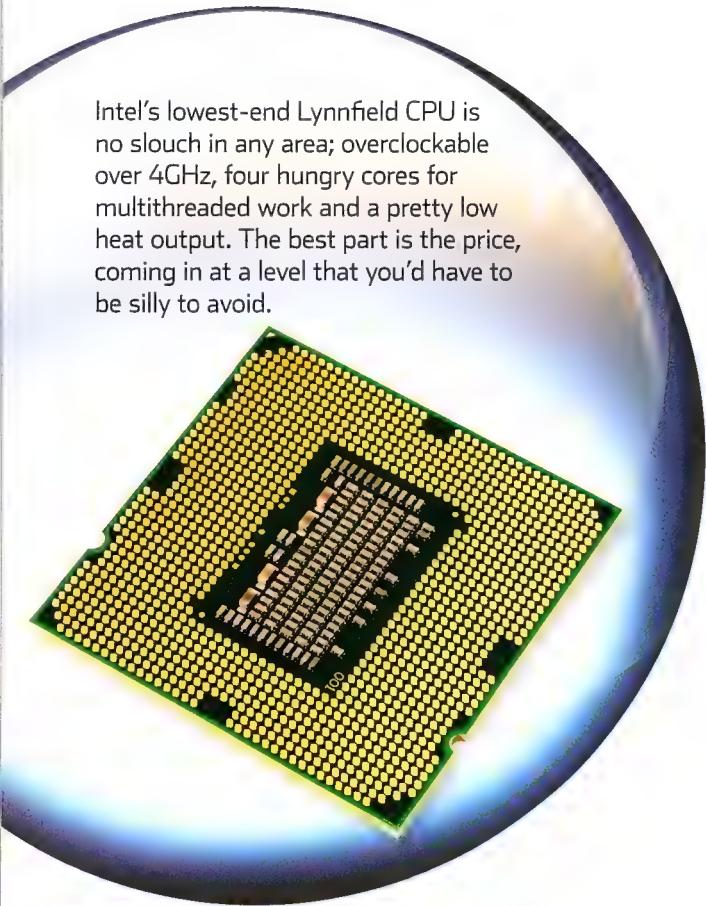
Look at the fancy 'Duemilanove' super-Arduino board, for instance. It'll cost you less than \$40.

These things are so cheap, and so accessible, that people are even using them for tasks that obviously do not actually require them. There are lots of electronics projects – like a 'sun tracker' to aim a solar panel, say – that clearly

KITLOG

These are our four basic systems, with something for every taste. On this page, the **Basic Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. It's the best value system for those who want a lot of processing grunt, but who don't want to sacrifice the upgradeability or compatibility that is so important. Intel's going to keep the P55 socket around for quite some time, so making the leap to this new platform is well-timed.

Intel's lowest-end Lynnfield CPU is no slouch in any area; overclockable over 4GHz, four hungry cores for multithreaded work and a pretty low heat output. The best part is the price, coming in at a level that you'd have to be silly to avoid.

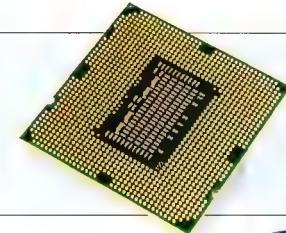


The Perfect PC, on the other hand, is the system everyone aspires to, with nothing but the best parts - without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – www.atomicmpc.com.au/?NUMBER – and you'll go straight to that review.

BASIC GAME BOX

CPU



Intel Core i5 750
PRICE \$250

Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD



GIGABYTE P55-UD4
PRICE \$225

A great value P55 board with some nice features..
Issue 106, Page 39

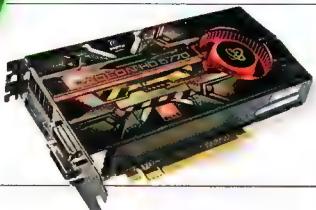
MEMORY



G.Skill Ripjaws 2000MHz
PRICE \$139

Great value memory with amazing overclocking.
Issue 106, Page 52

VIDEO CARD

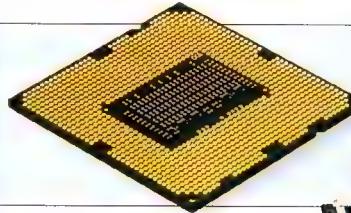


XFX 5770
PRICE \$245

A decent value way to get into DX11.
Issue 107, Page 47

THE PERFECT PC

CPU



Intel Core i7 870
PRICE \$710

The best enthusiast chip, evar.
Issue 105, Page 34

MOTHERBOARD



ASUS P7P55D Deluxe
PRICE \$310

Increase your performance, sex appeal and social standing!
Issue 105, Page 41

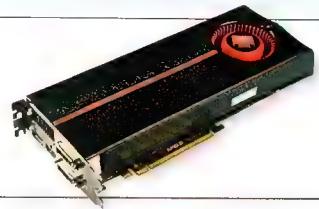
MEMORY



Corsair Dominator TR3X6G1866C7GT
PRICE \$388

Plenty of memory, blisteringly fast and darn sexy.
Ref ID: 149838

VIDEO CARD



ATI 5870
PRICE \$550

The first DX11 card powers through all games.
Issue 106, Page 42

For more builds check out the Kitlog E-mag at atomicmpc.com.au/kitlog

SUBTOTAL: \$1841

COOLER



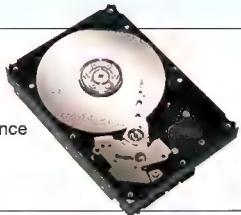
Aywun A1V8
PRICE \$52

Performs well, incredible value, bloody awesome.
Issue 103, Page 47

SYSTEM DRIVE

640GB HDD
PRICE \$90

Best price/storage/performance choice out there.



DISPLAY



AOC 2216Wv
PRICE \$225

Great 22in widescreen for all your gaming needs.
Ref ID: 122168

AUDIO

Plantronics Gamecom 777
PRICE \$94

Solid set of cans with great audio.
Issue 101, Page 41



Onboard Realtek ALC889A

A decent chip that does the job.

CASE



Lancool Dragonlord
PRICE \$199

Vibration damped, great cooling and sexy looks.
Issue 105, Page 49

KEYBOARD

Razer Arctosa
PRICE \$58

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483



MOUSE



Verbatim Rapier V1
PRICE \$65

Great gaming performance and nifty features.
Issue 96, Page 43

POWER SUPPLY

Corsair TX-750
PRICE \$199

Quiet performance, great noise and plenty of cables.
Ref ID: 107260



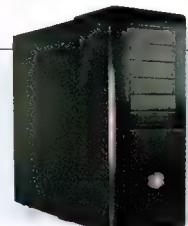
COOLER



Noctua NH-U12P
PRICE \$85

Two fans, quiet and nice overclocking capacity.
Issue 107, Page 48

CASE



Coolermaster ATCS 840
PRICE \$370

Heaps of fans, plenty of space, and dripping with quality.
Ref ID: 132479

SYSTEM DRIVE

Patriot Torqx 128GB SSD
PRICE \$620

Lightning-fast speed for your OS; chuck a HDD in for storage.
Issue 103, Page 45



KEYBOARD

Microsoft Sidewinder X6
PRICE \$80

Backlit, sturdy, magnetic numpad & macro keys; what's not to like?
Ref ID: 129535



DISPLAY



Dell 2408WFP
PRICE \$989

A huge 24in LCD screen for your prettiest pixels.
Issue 103, Page 57

MOUSE



Microsoft Sidewinder X8 Wireless
PRICE \$105

Cable-less, comfortable, lag-free and fraggable!
Ref ID: 148422

AUDIO

Logitech Z-5500D
PRICE \$450

Earth-shakingly good.
Issue 48, Page 56



Auzentech X-Fi Prelude

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Best soundcard ever!
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POWER SUPPLY

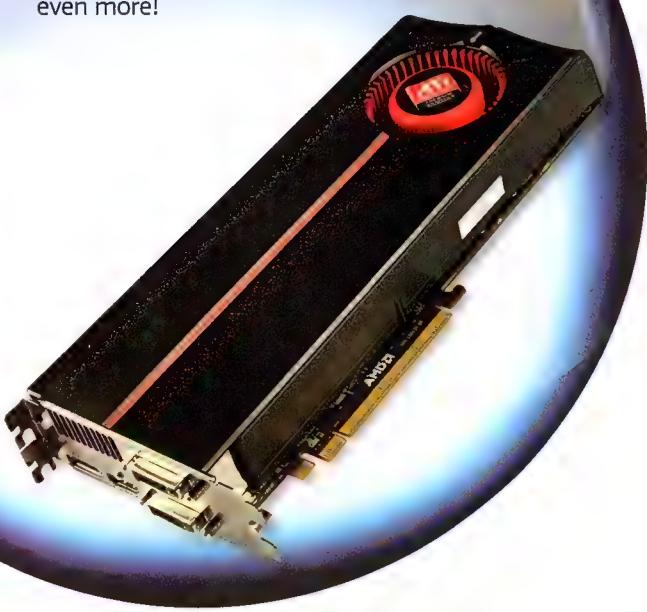
XFX 850W
PRICE \$295

Plenty of power, ultra-stable rails and a great price.
Issue 107, Page 50



The **LAN Box**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

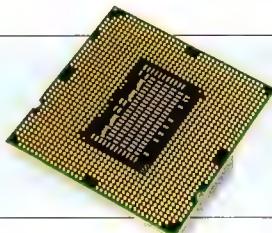
The 5870 is our latest love affair, wooing our affections with its sheer performance and stealing our hearts with its hardcore tech specs. If 3200 shader units aren't enough of a reason, just wait for the 5870X2 – it'll have even more!



Finally, for the more entertainment-minded – and really, that's all of us – there's our **Home Theatre PC**, ready to play movies and music quietly and efficiently. It's got plenty of speed for video encoding while you're away, but makes very little noise thanks to the passive components used – even the heatsink can be dialed down to emit as much or as little noise as you want. Perfect for leaving next to the big-screen TV for all your media needs.

THE LAN BOX

CPU

**Intel Core i5 750**

PRICE \$250

Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD

**GIGABYTE P55M-UD4**

PRICE \$205

Great overclockability,
nice value.
Issue 107, Page 40

MEMORY

**G.Skill Ripjaws 2000MHz**

PRICE \$139

Great value memory with amazing
overclocking.
Issue 106, Page 52

VIDEO CARD

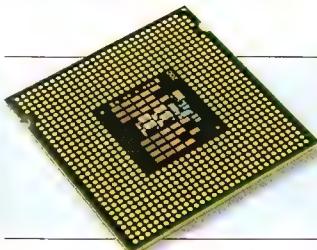
**XFX 5770**

PRICE \$245

A decent value way to get
into DX11.
Issue 107, Page 47

THE HTPC

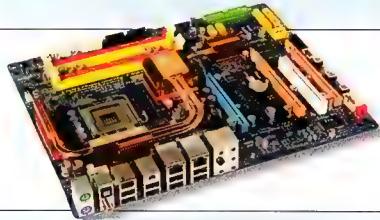
CPU

**Intel Core 2 Quad Q8400**

PRICE \$240

Quadcore to chew through
video encoding.
Issue 103, Page 36

MOTHERBOARD

**GIGABYTE EP45-UD3P**

PRICE \$200

The most solid P45 mobo
we've tested; cheap too.
Ref ID: 135617

MEMORY

**Patriot PC2-8500 C5**

PRICE \$108

Fast, tweakable and not too expensive.
Ref ID: 92524

VIDEO CARD

**Zotac 9400GT Zone**

PRICE \$95

Silent as the grave, and
HD playback is perfect.
Ref ID: 137603

For more builds check out the Kitlog E-mag at atomicmpc.com.au/kitlog

SUBTOTAL: \$1791

COOLER



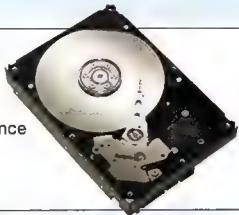
Intel Stock Cooler
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Does the job, fits under PSU well.

SYSTEM DRIVE

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Best price/storage/performance choice out there.



DISPLAY



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Great 22in widescreen for all your gaming needs.

Ref ID: 122168

AUDIO

Plantronics Gamecom 777
PRICE \$94

Solid set of cans with great audio.

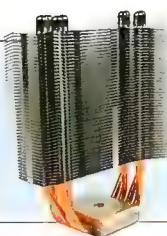
Issue 101, Page 41



Onboard Realtek ALC889A
PRICE \$225

A decent chip that does the job.

COOLER



Aywun A1V8
PRICE \$52

Performs well, incredible value, bloody awesome.

Issue 103, Page 47

CASE



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SYSTEM DRIVE

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KEYBOARD



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OPTICAL



LG GGC-H20L
PRICE \$175

Bluray and HDDVD playback - best of both worlds

CASE



Antec Sonata Elite

PRICE \$150

Quiet and vibration damped, subtle and avoids attention.

Issue 100, Page 46

AUDIO

Razer Mako 2.1 Speakers
PRICE \$469

Stylish tub-thumpers.

Ref ID: 126695



ASUS Xonar HDAV 1.3
PRICE \$279

Nice sound, expansion good.

Ref ID: 135112

KEYBOARD



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FAN



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POWER SUPPLY



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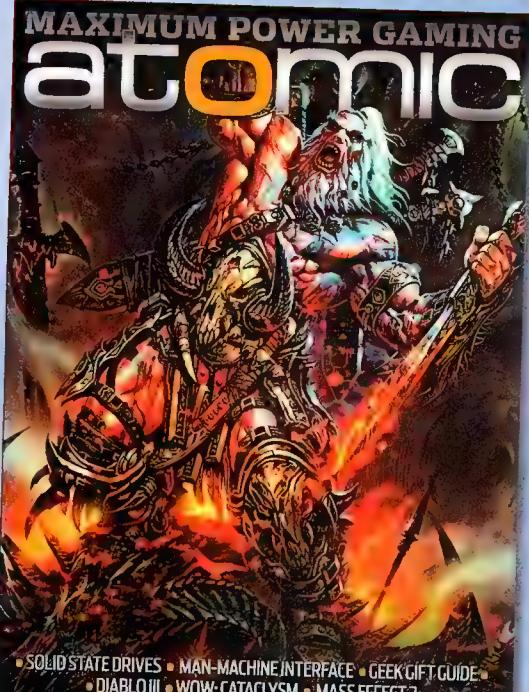
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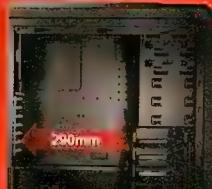
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PC-K58/K58W	Front: 140mm x 1 @1000RPM Rear: 120mm x 1 @1500RPM
PC-K56/K56W	Front: 120mm x 1 @1200RPM Rear: 120mm x 1 @1500RPM USB 2.0 x 2 / HD+AC97 Audio
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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

We're back to basics this month.

Following on from our super-duper PC building guide, we've got a simple tutorial on troubleshooting those new PC niggles and issues. There's nothing more frustrating than build a killer rig, only to hit that power button for the first time and have nothing happen, or to feel that your demon build isn't performing quite as powerfully as you want. Our simple guide to what can go wrong with a new PC, and what to do

about it, should see you sorted.

Chris Taylor returns this month with some timely advice for recent students who've just finished their HSC – and I know that's some of you – and are waiting on or about to get their university admissions sorted. The move from high school to uni is tough, and even tougher if you don't find yourselves in the course you wanted, or didn't score as high as you might have liked; but Chris has you sorted.

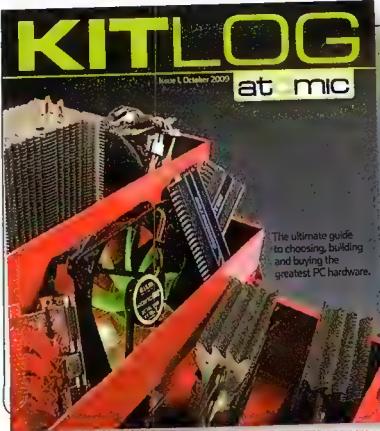
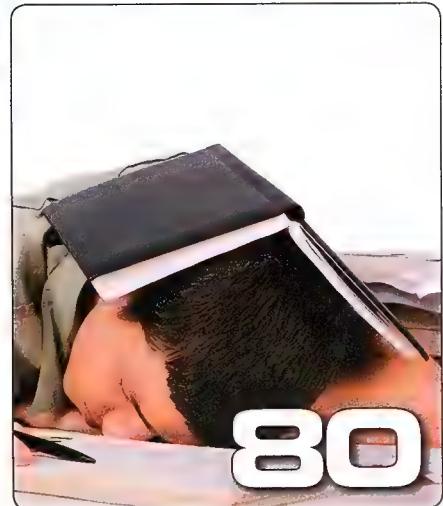
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| PC problems made simple. | |
| Atomic.edu | 80 |
| What to do when you don't get into the course or uni you were hoping for. | |

80



Do you like building systems?

Are you keen to always know the best hardware for any PC build or rig? Then you need to check out our new KitLog eBook, a quarterly online publication dedicated to showing you the best gear for more than a half-dozen PC projects.

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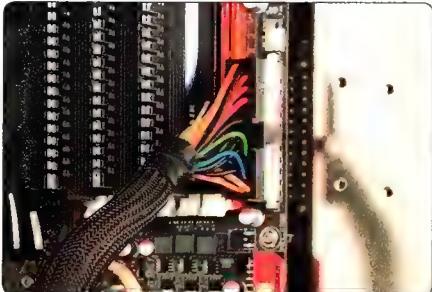
Doctor Atomic

PC not turning on, or crashing at random? Have no fear – Dr Atomic is in the building, with remedies for common symptoms of a troublesome computer.

Having put so much hard work into choosing all your components and building your new PC last issue, it can be heart-breaking to find that it doesn't work properly. There's no need to feel too disheartened though, as these problems are often easy to fix. Of course, there's always the chance that one of your components was dead on arrival. Any components that are DOA should be returned to the retailer, but these aside, the most common problems are simple errors that can be easily fixed.

When troubleshooting a new build, it can be invaluable to have an older PC handy in which to test the components, as you can simply swap out each component and test it individually. This might require a little help from your friends if you don't have a spare computer, and a pal with a PC can help you test your components too.

With a little detective work, you can home in on the component that's responsible for your PC's coughs, splutters and crashes. Alternatively, some motherboards have an LCD screen (or a bank of LEDs) to show where the problem lies. Refer to the manual to find out what these POST codes mean. The explanations can usually be found at the back.



Loose cables are a common cause of PC problems.

No lights on the motherboard

Most motherboards have a few LEDs, which should light up as soon as the PSU is connected and plugged into the wall socket – even when the PC is switched off. If the LEDs fail to illuminate, check that you've plugged in the correct leads from your PSU to the motherboard: the thick 24-pin ATX cable, and the 4- or 8-pin ATX12V/EPS12V cable. Make sure they're securely pushed into the sockets and, if it's a modular PSU, that the cables are connected properly to the PSU too. If that doesn't solve the problem, try a different power cable and power socket. If you still have no success, remove the PSU and try it with another motherboard. If it works fine in a different PC, your motherboard is most likely dead. If it doesn't, the PSU is probably at fault.

Nothing happens when you press the power switch

Make sure that you've wired up the power switch correctly to the motherboard's front panel header. You can check the front panel header illustration in your motherboard manual for clues. If this is correct, and the lights on the motherboard are illuminated, then an incorrect setting in the BIOS may be preventing the PC from booting. Clear the CMOS (by either using a jumper on the motherboard or removing the battery for ten seconds). Both can be located using the motherboard manual. It's also possible that you may have a short circuit, so check for loose screws inside the case. As a last resort, remove the motherboard from the case and try turning it on.

The fans spin, but the BIOS reports a CPU fan failure

You've plugged the CPU fan into the wrong header on the motherboard, so the board can't read the fan's speed. Plug the CPU fan into the correct header. You can find this by referring to the manual.

The hard disk spins up, but the fans don't

Either you haven't plugged in the fans, or an object is physically preventing them from rotating. Check that no cable or other object is obstructing the fans, and make sure they're connected to either the PSU or the motherboard.

PC POSTs, but switches itself off a few seconds later

This is often caused by the CPU heatsink not making proper contact with the CPU, and the CPU overheating and shutting down. Remove the heatsink completely and fit it again, paying attention to whether the pins have gone through the holes. Line up all four pins with the holes before pushing each one through in turn, and make sure that it's fastened securely.

Abnormally high CPU temperatures

This is another symptom of an incorrectly fitted heatsink, so follow the advice above for reseating it. You may also have applied too much TIM

to the chip's surface. Clean it off and apply a smaller amount. Check that the heatsink faces the right-hand side; the fan should blow air out of the case rather than move it around inside.

The PC beeps repeatedly

This often indicates a problem with the memory. The motherboard may have incorrectly detected the memory frequency or SPD settings, so clear the CMOS first. If the problem persists, remove the memory and try each stick in a different slot in turn. You can also try the memory in another PC. If the symptoms still occur, the memory could be faulty.

No display on the monitor

There are a number of possible reasons for this. Check that the graphics card is securely seated in the PCI-E slot (none of its gold edge connectors should be visible), and that it has enough power connections – modern cards sometimes have two plug sockets, neither of which is optional. Check that the graphics card is actually turning on by powering up the PC with the side panel removed and checking that the card's fan is spinning. Make sure the card is securely connected to the monitor – DVI cables must be connected before you boot the PC, so try resetting the PC. Finally, check that your monitor is set to display the correct input.

Faulty memory can also be a culprit for this symptom. Try booting the PC with just one DIMM slotted in, and try each DIMM. If you find that the system doesn't boot with one of the DIMMs installed, you have your suspect.

CPU not supported by BIOS

If you have a brand-new CPU and an older motherboard, you may need to update the BIOS before it will support your new chip. Visit the manufacturer's website and download the latest BIOS. You'll need to use an older chip to boot the motherboard in order to load the new BIOS, so a second PC or a helpful friend is a necessity in this situation. Make sure you follow the instructions to update the BIOS correctly – using the wrong updating software or BIOS version could render your motherboard useless. Most motherboards have BIOS flashing guides in their manuals.

Hard disk clicks/odd glitches in Windows

The dreaded sound of a horribly clattering hard disk is the first sign that it will soon break down, taking all your data with it to silicon heaven. As long as you can still access the drive in Windows, back up any valuable data it contains. Then, if the disk is under warranty, return it to the vendor.

A problematic hard disk can also cause odd pauses and glitches in Windows, especially when loading data. Make sure that the SATA cables are securely attached – it's very easy to knock them loose – and try a different cable, and then a different SATA port on the motherboard.

Video card making a squealing noise

Nvidia graphics cards have a very audible way of reminding you that you forgot to plug them into the PSU. If you hear a loud screeching beep, switch off the PC and make sure that the graphics card is connected to the PSU.

PC rattles when it's in use

The major sources of noise from most computers are the components that have moving parts – in particular, the hard disk and the DVD drive. Each time you place a disc in the DVD drive, it spins up and can make the entire case vibrate. Tighten the screws and consider investing in rubber mounting grommets.

System keeps forgetting the date

The battery that keeps the motherboard's electronic clock ticking over is running out. You can buy a replacement from a hardware store, or take one from another motherboard.

3D performance is unusually poor

Check that you have all the latest drivers installed. The most important

drivers are those for the graphics card and the motherboard chipset. Access the BIOS and ensure that your PCI-E bus is running at full speed (either 16x or 8x, and at 100MHz). After Windows first boots, press Ctrl+Alt+Delete to bring up the Task Manager. Sort the listed processes by CPU usage and look for anything that's consuming more than 3 per cent. Ensure that no virus scanning or hard drive defragmentation software is running in the background. Close all unnecessary applications in the system tray to free up as much memory as possible. Check the temperature of your graphics card too, using either the driver monitoring software or a standalone app such as RivaTuner. If the card is too hot, it won't run at full speed. Consider adding extra fans or more powerful versions if this is the case.

Blue-screen of death during Windows Installation

This could simply indicate a problem with your install DVD, so start by cleaning the disc. If the problem persists, your DVD drive or the SATA cable could be at fault, as both of these can break. Replace the SATA cable with another from the motherboard package and try again. Memory can also cause BSODs, so once again, remove the sticks, try each slot in turn and test it in another PC. You might also need to set the voltage of your memory manually in the BIOS, especially if you're using fast, low-latency, enthusiast-grade modules.



You can't always get what you want



But with Chris Taylor's help, you might be able to get what you need.

Congratulations to those readers who've just finished year twelve. By now, you should have finished your exams and be impatiently awaiting your results. Hopefully, you'll get the sort of marks you need to get into the course you wanted at the university you wanted. If by some chance you don't, all is not lost. There are numerous pathways into that dream course.

Preferences

In Victoria, at least, when your end-of-year results come out there is a short window of time during which you can change or add to your tertiary preferences. Your school's careers advisor has probably drummed this into your head now, but if not, make revisions based on your performance. If you didn't do as well as you expected, don't remove the University of Melbourne or Australian National University – you still might get in – but ensure you have a couple of courses and/or institutes that readily accept applicants with scores in the vicinity of yours.

Each state and territory has a course guide, published annually. Pick up a copy at the local newsagency or visit the relevant website. These guides will detail the 'clearly-in' score for the previous year ('clearly in' scores tend to change a little bit each year) as well as the pre-requisites, such as having completed specific year twelve-level subjects to a certain standard (i.e. a score of 25 out of 50 in Specialist Mathematics or interstate equivalent).

If you're changing preferences this late in the year, taking note of any extra requirements – portfolios, interviews, special forms – is vital. The special requirements are no doubt due in the very near future. Be warned: at this point in the year, you may not be able to add some courses to your list of preferences.

If your results are way below what you

expected to receive and you can't find any universities or courses that offer similar material and outcomes for students with lower entry scores, you should consider adding totally different courses to your list of preferences. If you wanted to get into a Bachelor of Computer Science, for instance, but didn't get the marks, it'd be worthwhile applying for a Bachelor of Information Technology or some other course you qualify for. Ideally your alternative will be in the same faculty, but it doesn't have to be. If you reckon you can stand Arts or Commerce for a year, go ahead and apply for them. Again, don't get rid of your initial preferences – you may get in on the second or third round of selections – but you need to do ensure you're going to get an offer of some description.

The idea isn't that you'll finish your Bachelor of Arts, Commerce or Information Technology (although you might find you like the alternative to look into the option of a double degree). Once you're in the university system, it's not too hard to move between courses and institutes after your first year of study. You need to get semi-respectable marks (a credit average, say), but that's about it. If your alternative is relevant to the course you really want to get into (i.e. you do a year of a Bachelor of Information Technology because you want to get into a Bachelor of Software Engineering), you may well be eligible for recognition of prior learning when you eventually get into your desired course.

Say you wanted to get into the Bachelor of Software Engineering but performed poorly in year twelve mathematics. If you want to strengthen your application for the Bachelor of Software Engineering in 2011, you could try and

work a unit or two of university-level mathematics into your alternative. Depending on what you're studying, you may well have an elective unit or two. Fill these with basic mathematics, physics, English or whatever your weakness in year twelve was.

TAFE

As well as other university courses, TAFE is a viable option. Some universities have relationships with specific TAFE institutes, making the process of moving from one to the other relatively painless. Some universities, such as Victoria University, have a TAFE wing. If your results aren't as good as you expected, you can (and should) apply for a relevant TAFE course. For instance, if you want to get into a Bachelor of Multimedia (Games Development), look into undertaking a Diploma of Multimedia or Diploma of Games Development. Upon completing your TAFE course, you'll have a good chance of being accepted into university. Not only that, but you should be eligible for some recognition of prior learning. Recognition of prior learning is a very good thing, as it shortens the amount of time (maybe by as much as a year, if you've got a Diploma under your belt) you need to spend at university, thereby reducing your eventual HECS bill.

Again, like with an alternative university course, take a TAFE course seriously. Maybe it's quite far removed from what you actually wanted to do, but please, put some effort in. Attend classes and complete all required work to or above the expected standard. The better your marks are, the better your chances of getting into your desired university course are.

Talk to someone

Again, don't write off your desired course for 2010 and replace all of your preferences with alternative university courses and TAFE diplomas. Contact the university. If you didn't perform to



the required standard in, say, 2U Mathematics, contact the university and ask what they can do for you. If your overall score is solid and it's only the mark for that one (vital) subject holding you back, ask if they offer some sort of remedial mathematics class. Universities offer a vast amount of assistance to students who struggle with written and verbal communication. Some offer the same sort of assistance to students who struggle with mathematics. Even if there's nothing offered through the university's student services branch, you may be able to elect to do a first semester subject in foundational math-

significantly between the states and territories. You may find that you'll be allowed to repeat it, but a certain percentage of your marks will be deducted from your second set of results for the privilege. It's unlikely you'll be in this situation, but if you are there are options.

The first few weeks

If you get into your chosen course (or an alternative course you are happy to stay in), be warned: university is very different to secondary school. In university, you have to be self-sufficient. Your lecturers and tutors have lots – maybe hundreds

preferences, speak to or visit the universities before making a decision. While it's possible early in the year to organise a transfer between courses or institutes, it's better to make informed decisions before next year. Just in case you get into a course, dislike it and are faced with only two options: leave before the HECS census date or tough it out for a year, get respectable marks and apply for something else.

Once you've been accepted into a course, whether it's an alternative to your ultimate goal or your dream course, get your hands on the assigned textbooks, readers and any other materials you'll need to have in the first semester. Hit up the university's second hand bookshop or independent bookshops near the campus (there are a number of second hand and academic book supplies near the University of Melbourne, for instance). You'll save a hell of a lot of money.

Good luck in university. As we've said a million and one times, the transition from secondary school to university can be difficult, confusing and disorienting. It's only once you're truly independent that you realise how much you were babied for the past six years. If you're having difficulty, you need to talk to your lecturer, your tutor or student services. You may well need to find an alternative textbook to the one assigned by your lecturer. You've worked very hard to get into university, so you need to put in the effort to ensure you stay there. 

...the transition from secondary school to university can be difficult, confusing and disorienting.

ematics. Alternatively, some TAFE institutes offer Certificate-level courses in foundational science and mathematics. You may be able to knock such a course over in a few weeks or months.

Re-doing year twelve

Unless you've performed really poorly, re-doing year twelve isn't an option worth considering. Really, why would you do it? A year in TAFE and a bit of effort and you'll be fine. If you have really made a mess of things, though, your state may allow you to repeat year twelve. You can do it through TAFE. The regulations on this vary

– of students who they see each week. You most likely won't get reminded when work is due. Keeping up-to-date on assigned readings, week-to-week tasks and the expected level of competency in the material is your responsibility.

A lot of people drop out in those first few weeks because university or the course isn't what they expected it to be. Take the window of time during which you can change, add or remove courses from your list of preferences to further research anything you're not knowledgeable about.

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NEXT MONTH IN PC AUTHORITY...



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Who are technology's winners and losers for 2009?

You've had your say, you've voted on the best and worst brands for broadband, mobile phones, laptops, PCs, cameras, online retail, security software and more...

Now, in the January issue of *PC Authority*, we present the results of the 2009 *PC Authority* Best Tech Awards.

PLUS The *PC Authority* team picks the absolute gold standard cameras, laptops and more. It's tech par excellence 2009!

ALSO NEXT MONTH:

DSLR GROUP TEST

Stepping up from a point and shoot camera? We test the latest DSLRs.

WINDOWS 7 - THE REVIEW

Our in-depth test of the new OS.

SCI-FI LEGENDS

We delve into science fiction's impact on technology.

GAMEPLAY

GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

Click... click... click... DING!

If those noises make you salivate like some Pavlovian mammal, you're going to love our chat with Blizzards devs about the future of Diablo III. We talk all the world background, graphic design, and monster psychology going into the most anticipated click-fest of all time.

We also get a lot of reviewing in – it's just that

time of the year. We play two short gems, in the shape of Halo 3: ODST and Uncharted 2: Among Thieves, get some quality time with upcoming RPG epics from BioWare, and get our war on with Operation Flashpoint: Dragon Rising.

Also, we've got shots from our last big reader event, the awesomely fun and competitive Borderlands LAN we ran last month. Win!



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Adding depth to the world of Diablo

It might have a new third dimension, but there's more to Diablo's new clothes than just a polygon count. Seamus Byrne dives in.

You could be forgiven for not knowing much about the world of Sanctuary. Diablo hasn't spent too much time developing the world in which the game is set.

"Previous Diablo games established the overall tone of the universe, but they didn't tell us a lot about it," says Jay Wilson, Game Director on Diablo III. "We really want people to know the layout, and what Sanctuary is all about. And to make sure it can handle different environments, different cultures, and that the characters within it are really interesting. To make it a world worth living in."

But hold on, readers. I can see some of you looking concerned that this might be code for 'make Diablo a lot slower'. Never fear, for Wilson assures us 'fast paced RPG action game' is still what it's all about.

"We're doing more questing, but we are trying to streamline it," he says. "Not as dense as World of Warcraft. Our game moves really fast so quests that require a lot of reading aren't really our goal. But having quests with a lot of flavour, context, and a sense of the overall story? That's really important."

You'll find a lot more flavour around Sanctuary,

too. Books you can find reveal more of the world story, if you want to read it. There are also many characters in the world who have backgrounds, and story arcs of their own.

Your hero will also have more of a story than ever before. Each class hero has a story of their

own, and will participate in voiced dialogue with NPCs.

"It's much more interesting to have a dialogue with an NPC than to have the NPC monologue at you," says Wilson. "We don't want to go into dialogue trees, because again that would





slow the game down. But we want to have conversations. We want to have character arcs and have the PCs be the motivators that drive the story. We don't want them to be a plain white sheet of paper while the rest of the game gets to be colourful."

Please walk on the grass

While the story is in the midst of a significant evolution, the world itself is undergoing a revolution with its move to 3D. Julian Love, Lead Technical Artist on Diablo III, tells us just how the transition from sprites to 3D models impacts on the basics of development.

"There are a number of benefits. A lot of them in animation, and our ability to do a lot of them and make variations on things," says Love. "The variation cost in a sprite game is the same as the cost of making something from scratch. In a 3D game you can make a lot of variations very cheaply."

With the world itself also shifted to 3D, there's also a fundamental shift as your character is now genuinely inside the environment, and will be able to interact with it. Back in 'the day', the world of Diablo was really just a backdrop you played on.

"Now you can go around and wreck things!" says Love.

Story arc? Give me power!

This lush new 3D world is also full of that amazing bit of science called physics. Specifically, physics courtesy of the Havok physics engine. And when we asked for an example of a cool new experience of what Havok brings to the table, we got a story that made us tingly where it counts.

"The feeling of your own arc of power is something you will really experience," says Love. "When you start off you might just have your regular weapon, like an axe. When you hit something, it will break. But it's not exactly going to explode. Then as you power up, get bigger and bigger skills and gear, you get to a point where you're literally destroying whole rooms of things with the click of a button."

Wilson says there are also new things that could have been done before, but they're just more fun with physics. Like bouncing grenade-like projectiles that can be thrown around

corners or bounced off walls.

In the end, it's just a whole lot more satisfying to kill hordes of enemies when you're playing with polygons.

"It's easier to rip limbs off," says Wilson. "It's easier to have things fly around the environment. It's easier to put in lots of destructive elements. All those things make the general tone of skills and action a lot more exciting."

A monster story: Arrive, fight, die

Animating your foes is something Love sees as a critical part of the story. And with 3D modelling, it's much easier to deliver a greater diversity of animations and variations for you to encounter.

"Monsters really don't have a lot of time on screen to get their personality across," says Love. "One of the ways we do that is through animation. We have a process that we go through. How do they get on screen? What are they going to do? And how are they going to die? We really try to deliver the idea that each monster is something new and different and is thinking and doing different things. That each has a purpose and a back story."

"One of our really big ones is how do they get on screen," says Love. "They're not just there, they don't just pop on. Maybe they crawl down a hill, or from under a sewer grate. Anything that sells the idea that monsters are really coming from everywhere. And that the world is not just limited to the play space you happen to be on."





we want to do it, not simply because the engine demands it."

"The biggest addition we've made is randomised scripted content," says Wilson. "We are really trying to make a game that has a lot of scripted content, quest content, and events that the player can get involved in that are randomly placed around the world. You'll probably never see the same combination of events in any one place."

We prodded the Game Director for a more technical insight on random scripted content to

Play Diablo III again. And again. And again.

The Diablo series set a benchmark for highly replayable games thanks in large part to an engine that randomises the experience each time you play. While you will experience certain features more than once, the randomisation

Looting made fast and friendly

Quite a few enhancements have gone into how you deal with loot in Diablo. Net result? You pick up gold just by touching it. No clicks necessary. Instant time saver.

"When magic items drop on the ground we put effects on them so you can really see them," says Wilson. "So that helps. 'Oh, there it is. I want it. It's shiny and exciting.'"

Pop up item tags are another significant upgrade, with user controlled options for how this UI element works in game.

"Essentially we're trying to set it up so you don't have to have your finger on the ALT key the whole time you're playing," says Wilson. "When you come on screen and there's an item the tag pops up, then fades out over time so they're cosmetically nicer. You have options to have them pop up as soon as they hit the ground."

Plus some big news — ninja looters, you're history. Now, in co-op, loot drops for each player, so there's no competitive grab for loot to worry about.

"One of the things we wanted to change about Diablo was that it is a co-operative experience," says Wilson. "There were a lot of systems that were actually harmful to co-op play, like competitive loot grabbing. Now you get your loot, I get my loot."

"You build your area, then you put a script on it...It's a fun way to build out an area because there's less construction and more playtesting."

delivers a freshness each time you head back into the world.

Now Blizzard is bringing the latest in procedural content generation to the world of Sanctuary, and has very likely set yet another benchmark in how to build a world that is both deliberate and random.

"We're more focused on the things that are random," says Love. "We're able to do it when

help us wrap our brains around the idea.

"Most areas we create we essentially leave big holes in the terrain and then design events to go in those areas — terrain and all. So you could have pretty much anything you would see in a fully scripted game," Wilson says. "You could have a caravan that has been destroyed and is burning by the side of the road, with a quest giver who wants you to go kill some monsters."





nearby. You could have an escort quest, or a new town that wasn't there before, or a really powerful monster, or a dungeon entrance. You could have a dungeon entrance that has a really powerful monster in it that has a quest from a nearby town to go and kill it. This can all be randomised."

Separate to these scripts are even more scripts that randomly distribute monsters in the environment. These control the choice of monster, the frequency of monsters, and the combinations of monsters that can appear.

"In some ways it takes longer to do your random distributions than it would to do hand placement," says Wilson. "It certainly takes longer to place them by hand, but overall an area where you have to randomly distribute things you have to play over and over and over again. The nice thing is you can get to that playable state really fast. You build your area, then you put a script on it, then you just play it. It's a fun way to build out an area because there's less construction and more playtesting."

Testing the hell out of a randomisation engine sounds like a recipe for amusing failure. Or even a recipe for awesomely evil enemies that simply cannot be defeated.



"We get combinations that are bad," admits Wilson. "Like we discover 'Oh, it's probably not good to put a dozen summoners in the same area' after two or three groups happen to hit on top of one another."

"We have a system for creating random bosses and we've got some really cool powers on some of those guys," Wilson says. "But we've had combinations where we got a boss that can create a duplicate of itself coupled with a vampirism ability! So it can create duplicates, all of which self-heal. Well you might as well just give up at that point!"

While the first reaction might be to reach for the monster engine equivalent of the ban hammer, taking the time to wait and see how



the players dealt with the situation sometimes proved you should never underestimate a player's inventiveness.

"What sometimes seemed to be a really bad combination were some of the greatest moments a player had. When they managed to overcome the thing it became the event they never stopped talking about."

Endgame... and beyond?

For all the procedural experiences, it still comes down to giving the armies of Burning Hells a bad hair day. Wilson suggests we can also expect an improved endgame experience — especially for those playing the game through more than once.

"Replayability goes beyond just randomness," Wilson says. "The endgame for Diablo II was extremely repetitive, so we're going to be focusing on some systems to try and make sure Diablo III's endgame uses a lot more of the breadth of the content we create."

And if you're wondering, this is not the end for our newly refurbished world of Sanctuary.

"We certainly have a story arc that we really feel we're closing here," says Wilson. "But it doesn't mean we're closing the door on Diablo. Not by any stretch of the imagination: I already know for a fact we have more stories we want to tell in this universe."



MODIFICATION

Neotokyo

with Ashton 'I ain't 'fraid no mod' Mills

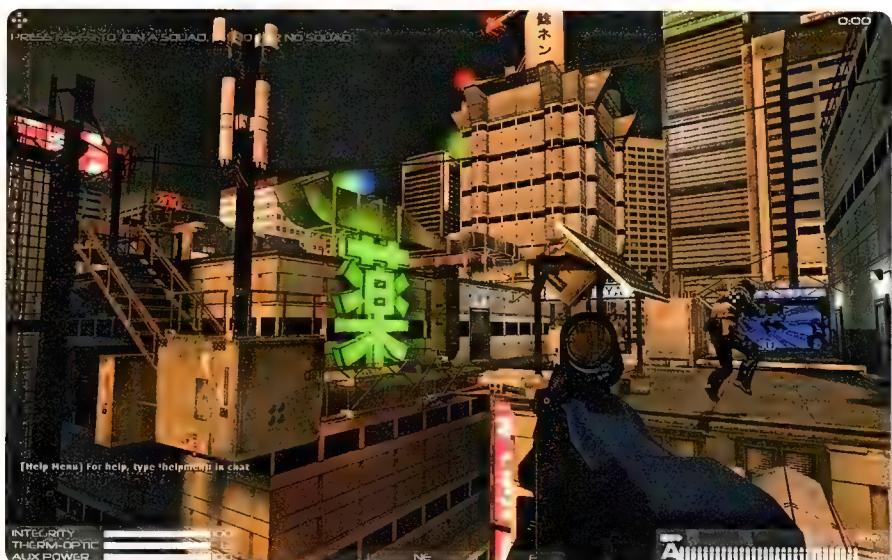
Game Half Life 2
URL www.neotokyohq.com

Neotokyo is a source-based mod that's been five years in production, and modeled after the creativity of Masamune Shirow (Ghost in the shell) and Katsuhiro Otomo (Akira). Set thirty years in a futuristic Japan, a failed coup by the armed forces leads to an ongoing war between the government's National Security Forces (NSF) and a breakout group of the armed forces called JINRAI.

In a nutshell Neotokyo is a futuristic Counter-Strike with teamplay elements. Unique to the mod is a twist on the classic Capture The Flag mode with Capture The Ghost, involving finding and keeping a fragmented robot which grants the bearer the ability to 'see' enemies through the walls, as long as he remains still. On its own it's not a huge advantage, its key lies in using teamspeak to communicate enemy movements to team mates.

There are ten maps ranging from inner-city Tokyo to snow-driven temples along with 18 different player models to spice up the visuals. Each side has three classes – Recon, Assault and Support – with a host of weapons and abilities such as night vision and thermal vision, or thermoptic camouflage (aka cloaking). Better weapons are unlocked as you gain in rank, and the use of squads (members of which are visible on your HUD) helps in coordinated strategies.

As a Source-based mod the graphics are crisp, clean, and fast and the on the whole the mod is finely polished. Just like Counter-Strike don't expect to master it overnight; experienced players will tear you a new one on your inevitable



de-noobifying learning curve. Still, using your environment to advantage can counter even the best players, as can using each class' skills effectively.

Credit must go to the authors for the superb

attention to detail on the models, game world, and weapons. And for a cheat-sheet on how to play see the Media section of the website. If you're looking for a futuristic teamplay mod, give it a go, it's free after all.



1+1=1

Game Fallout 3

URL www.fallout3nexus.com/downloads/file.php?id=8872

So you think you're a suave, sensual, romantic? Have you thought about how you might pop the question to your significant other for a life of wedded, marital, bliss?

Kristy, aka PuffyPuppy, did just that and came up with perhaps the most geeky proposal of all: her man loved playing Fallout 3, so she made a mod to propose to him.

Not being a master modder, Kristy first contacted Bethesda to see if her idea was plausible. Quite possibly, she was told; she should put her question to the experts in the modders forum. She did this and soon her thread attracted enough attention that a plethora of modders were onboard, and the result after three months of work was 1+1=1, aka The Wedding Proposal.



Far from a small piece of work, 1+1=1 includes a new location, a quest, new items, voice acting by Kristy herself, and an in-game model of the real-world ring. Modders who helped make the mod also gave wedding 'presents' in the final room.



Aion Client v1.5.0.9 Full Installer

Wolfenstein Patch v1.11

Combat Arms Patch v29 to v30

Race Driver: GRID Patch v1.3

Gothic 3 Community Patch v1.7.3

Europa Universalis: Rome Gold/Vae Victis Patch v2.2

Dawn of Discovery Patch v1.1

Anno 1404 Patch v1.1 Patch

World of Warcraft Patch v3.2.2 to v3.2.2a

Atlantica Online Patch v20902 to v21006

Need for Speed SHIFT Patch v1.00



She stars in it, of course, held captive by crazed pimp and his Raider buddies. And, once rescued by her in-game hero, pops the question like so: "Will you, Shawn, take me, Kristy, to be your post-apocalyptic love slave until death do us part?"

Love-slave you say, eh?

And yes, her man did say yes. Of course, it helps that saying no turns Kristy into a raging Deathclaw intent on tearing you a new one.

Hell hath no fury...





World of Warcraft: Cataclysm [PREVIEW]

Liz Skuthorpe gets some hands on time with the next big thing in WoW.

With Blizzard Entertainment's massive showcase BlizzCon now in the rear-vision mirror, it's time to look at the much-anticipated expansion announcement for the franchise's next installment, World of Warcraft: Cataclysm. We got hands on time with the new starting areas at a special press day following BlizzCon, and we can finally spill the beans.

Make no mistake, this is going to be bring massive changes to a game that's played by more than 12 million people worldwide; as well as new races, we'll be seeing a significant overhaul to the world itself and a complete reworking of the questing and levelling process. It's obviously a very bold move on the part of WoW developers, but hopefully one that will pay off. It's audacious and, in some ways, seems more like an idea for World of Warcraft 2 rather than an expansion, since new players to the game will not be able to participate in the original levelling experience as launch players. However, big changes will probably bring former players back to the game and give continuing players a new experience and keep them interested – all very canny on Blizzard's part.

So, what's in store for our intrepid adventurers as they return home from fighting Arthas in Northrend? Short answer; a lot.

The Lore

Azeroth is in for a shake up, quite literally. Deathwing returns to the physical plane and will

tear the continents apart, remaking the world in the process. For seasoned players this will mean a completely new levelling process - many old quests will disappear (and possibly become Feats of Strength, so do them while you can!).

After years of neglect the Twilight's Hammer cultists are getting their moment in the sun - sadly it's by assisting Deathwing in his return to the physical plane. His eruption out of the plane of earth, where he had been imprisoned in Deepholme, triggers earthquakes, tidal waves, never-ending storms and changes the face of

the landscape all over Kalimdor and the Eastern Kingdoms. The upside is, for players at least, that developers will rework zones that have long been considered unfinished, boring, or difficult to work around while levelling. Azshara, for example, was considered a very beautiful zone but essentially incomplete; quests were few and far between, and it was out of the way.

Come Cataclysm this zone will be changed to a Horde 20-30 level questing area, and the Khazan Goblins will have begun a simply audacious terra-forming project in the area – think Dubai and its man-made islands. This level of redesign, where the zone is practically unrecognisable from its prior incarnation, can be expected for the Barrens and Desolace as well.

Enter the Wolfman

The Alliance's lack of a bestial race has been on Blizzard's mind for some time, it would seem. The Horde have always had their Tauren, but Alliance were filled with pretty characters, the naysayers cried. Cataclysm should complete





the balancing of that prettiness factor that the developers started with the introduction of Blood Elves to the Horde.

The Worgen, originally human citizens of the state of Gilneas, are afflicted by a curse thanks to lore favourite, Arugal. Anyone who's been mauled by one of the Sons of Arugal in Silverpine will be familiar with these monstrous humanoid wolves. Each of the new race starting zones makes extensive use of phasing technology, which Blizzard has been implementing more and more in recent years. New Worgen players will begin their starting area years before the current game time as non-cursed human citizens of Gilneas. Locked behind the nation's walls, the citizens are attacked by roving bands of Worgen, who somehow made their way into the city centre.

As players work their way through the storyline, including the Greymanes and a featured NPC named Crowley, Characters are affected by a mysterious debuff, which counts down as they quest through the phased timeline. Eventually it becomes apparent that the beasts attacking the town citizenry are in fact former humans suffering from a virus-like curse – and you're afflicted by it!

Not only do the citizens have to deal with attacks from within, it soon becomes apparent that the Forsaken are planning an attack on Gilneas, with the intention of taking the port-city as a base of operations. Attacked from within and without, players eventually fall back to the Cathedral. Surrounded by Worgen, and with the

debuff rapidly counting down things generally look dire for the heroes. This triggers an excellent cinematic transformation scene when it's fully revealed to the players that the debuff is, of course, the beginnings of the Worgen curse.

Despite best efforts the city falls, and this leads to a split in the Gilnean population; Crowley leads a group of 'Feral' Worgen out into the forests where they eventually meet up with Night Elves. The ability for Druidic magic that apparently comes along with the lycanthic curse forges a link between the two groups and the Night Elves bring the Worgen into the Alliance.

The game surrounds for the city are lush and recall the environs we've become used to in Northrend, using lots of beautifully detailed wood and stone buildings. It's a little Burtonesque, but without the Nightmare Before Christmas vibe that you get in the Undercity. It suits the Gilneas population who get about in day-wear reminiscent of Victorian garden-party garb. Top hats all round!

I've got the best deals!

While the Alliance will finally get their monstrous race, the Horde are in for something on the smaller side. In an attempt to balance out the size issue for the two factions the Horde are about to be afflicted by a severe case of Goblins. Unlike the introduction of the Worgen to the Alliance, the Goblin starting area and entrance to the Horde faction is tied directly to the return of Deathwing and the remaking of the face of

Azeroth with the expansion.

Sitting pretty on the Isle of Khazan the Goblin city looks something like a warped carnival town – familiar for anyone who's been around Gadgetzan, but over the top with colour and neon signage. Characters start out running errands for the day's big party; one of the Trade Princes is having a bash and as a notable Goblin-about-town you need something to wear. Cue delivery shenanigans as you attempt to get ready for the fete.

But it's not long before rumblings in the earth intimate that something isn't right in Khazan, let alone the rest of Azeroth, and it soon becomes apparent that the little city state might not survive. Following the phased quest lines Goblin characters race away from the islands and eventually find themselves rescuing Thrall, who's on a special mission, having left Garrosh in command of the Horde.

This little tid-bit signals a massive shakeup for the Horde; Garrosh has given Orgrimmar a make-over and booted everyone but Tauren and Orcs from central Orgrimmar, as only these two races are warrior-like enough in his eyes. This is a big change for the Horde and will most likely fuel future collisions between the two factions as both now have more warlike faction leaders.

Game mechanics

Complicated stat systems and talents will be getting an overhaul and we'll see new professions. And of course for those who really enjoy the faction rivalry that WoW provides there should be plenty more war in Warcraft.

There's far more detail to come over the next year (or more) that we'll be waiting for Cataclysm's release, but the developers seem committed to some significant story development as well as game-play mechanics and for a game that has such an involved history that strikes me as a very good thing.

But keep an eye out for Gnome Priests – they're hard to get rid of once they've invaded your guild. LS

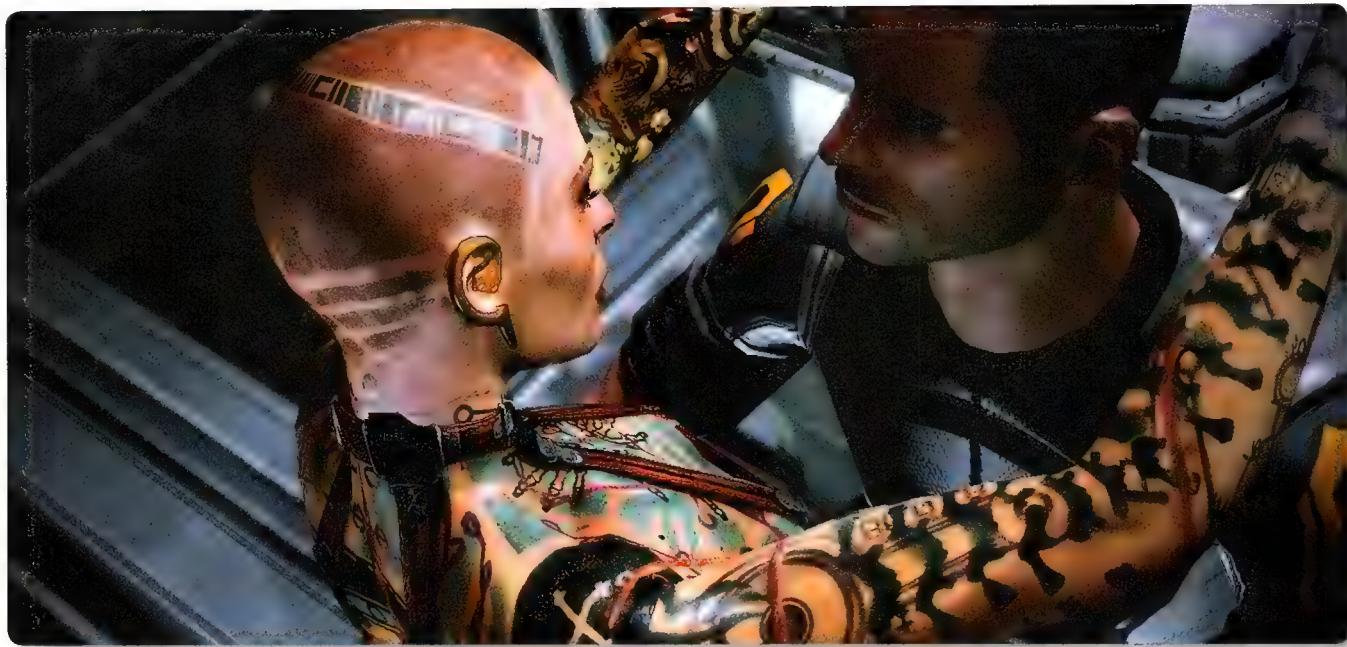
PC

Developer Blizzard
Publisher Blizzard
Website www.worldofwarcraft.com

Reworked zones; improved graphics; new races and quests

Can the lore get any more complex?





Mass Effect 2 [PREVIEW]

Shepard and his crew are back to save the galaxy... again.

One of the cruellest things you can endure in the business of reviewing games is the hands-on preview session. You get a few hours to play a game, tooling around different encounters to see the various aspects of the game, and then it's over. It's like getting someone addicted to crack and then telling they can't have any more.

But worse. Much, much worse.

Especially when the game in question is Mass Effect 2, possibly the most anticipated RPG ever, and even more especially when Mass Effect 2 is looking so... damn... good.

We recently got to have a brief chat and listen to Dr Greg Zeschuk, one of BioWare's founders, as he talked us through not just Mass Effect 2 but Dragon Age: Origins as well. He's a great guy – passionate about games and his games in particular, but that mustn't be too much of challenge when you've got a track record like BioWare's. The company just doesn't make bad games.

"We've made a lot of engine changes," he says as he starts getting warmed up over ME2, "fiddled with the lighting and stuff. And there's a lot more detail on the armour, for instance. It's

just a better looking game overall."

He's not lying, either. We got to see three segments of gameplay, one featuring some classic ME running and gunning, and the graphics are pumped up across the board. Those annoyingly grainy shadows are long gone, the detail is a vast improvement, and the devs have really gone to town on the camera work.

If the original was cinematic, this one is cinematic in the extreme. The best example of this is during the much more organic conversation sequences. These are no longer two-camera interview-style setups; instead, a far defter camera sweeps around the protagonists, cutting dramatically or panning slowly. The sense of filmic gravitas is wonderfully maintained, helped again by some top notch voice acting and some very adult scripting.

And, since this is space opera at its most operatic, the action has been ramped up significantly. Weapons now have holographic ammo counters, which is likely going to replace the cooling mechanic of the original. The rest of your squad is much easier to order round, and seem to be generally more effective at using their powers even if you don't micromanage them.

It's pretty much a case of everything that made the PC version better being re-implemented into all of the ME2 releases, but the biggest change would have to be access to heavy weapons. We got to play with a homing missile launcher that was, well, an absolute blast.

As to the story, well, Greg was a lot more tight-lipped about that, though we can say Shepard featured in each segment we played. "If the first game was all about the high end of politics in the Mass Effect universe, this one's about the dark side," Dr Zeschuk told us. The main quest hub is a criminal zone, and there's a much darker threat in play. And what about Shepard's much reported death?

"Well," Zeschuk said, "You'll just have to wait and see."

And we can't wait. DH

Xbox 360, PC (previewed on 360)

Developer BioWare
Publisher Electronic Arts
Website <http://masseffect.bioware.com/>

Slicker camera work;
great voice acting;
improved engine

Still haven't seen
the PC port

Anticipation rating

We're quietly cautious this is going to rock, but really want to see some PC code first.

86%





Dragon Age: Origins [PREVIEW]

Another epic RPG from BioWare? Is it another hit, or one too many?

BioWare's skill at producing RPGs is pretty much as solid a truth as gravity and taxes, but when we first heard of Dragon Age, we were a little bit... nervous? Fantasy RPGs are a dime a dozen, and even though BioWare's made some of the best – based off various versions of the Dungeons and Dragons franchise – Dragon Age looked like it might be a little too... samey.

We've had some hands on time, now, and we're no longer worried at all. Well... not much, anyway.

The game takes the bottled origins idea from Mass Effect, and crafts that in to a more honed, more targeted RPG experience. Based upon the race and background of your character, you get a different origin story that ties you into the main plot. We saw a bit of the human noble origin, and it involves you and your mother fighting your way out of a castle following some kind of betrayal or revolution.

These different origins act as your introduction to the world, and tie you into the game's larger plot, while also serving as bit of a game tutorial.



Dragon Age is a darker, more linear RPG experience than Mass Effect – the obvious comparison – and features up to 100 hours of gameplay, though BioWare's Dr Greg Zeschuk did tell us that the average game will last between 40 and 80 hours.

With that in mind, Dragon Age eschews the spoken dialogue of ME in favour of a more traditional text-based system. Gone also is the moral compass telling you if you are good and bad. Instead, Dragon Age will track not morals, as such, but how you relate to your party members. "It's more about who you talk to," says Zeschuk, "and what they think of you."

But the heart of a game like this is in the juicy adventuring and levelling mechanics, and that's what we got to see most of.

Each time you leave your camp (which itself moves about the world as the game progresses), you can choose who to take in your party, much like any other recent BioWare game. Except in this case switching between and controlling different party members is a much more fluid experience, allowing you to really micromanage more complex boss fights.

Thankfully, the game is usually one step ahead, and actually helps you choose the items you need. So, if you're getting hammered in a fight and need to drink a healing potion, the game will spot your low health and offer a healing pot as the first choice in the menu. This, combined with switching, makes big fights pretty easy, but you can also almost program your party members reactions. There's a lot of control options, and

they're very well implemented.

Graphically the game is as rich as you could want, with solid motion capture and some really detailed armour and weapon sets. Most impressive is the gore and blood splatter you get after a protracted fight; we only hope that survives the passage through Australia's classification system. Regardless, other effects, like showy spell effects and environmental draw distance, will still make sure that Dragon Age looks good even without gritty blood effects.

And with all that fighting comes XP, and with XP comes possibly the most satisfying part of a game like this – levelling your character into a virtual killing machine. Dragon Age features a mess of gear, and a range of Talent trees for each class. There are stats to tweak, inventory slots to fill, and all is right with the world.

We can expect to see Dragon Age: Origins on PC and 360 this November, and it'll follow later that month on PS3. Looking ahead, Zeschuk's also confirmed that BioWare's looking forward to a lot of player generated content and official DLC. "There'll even be some stuff on day one," he says. "But that's a secret."

Can't wait to find out. DH

PC, Xbox 360 and PS3 (previewed on 360)

Developer BioWare

Publisher Electronic Arts

Website <http://dragonage.bioware.com/>



Deep character system;
detailed combat skills; in
depth story



Some environments seemed
too linear and plain



Anticipation rating

We're not quite as excited
by this as we are about Mass
Effect 2, but this looks a keeper.

80%



Operation Flashpoint: Dragon Rising

Can this console/PC crossover match up to the depth and detail of the original?

Operation Flashpoint was the groundbreaking military FPS. It took the FPS and added a sense of realism that – up to that point – only flight sims or grand strategic wargames could deliver. It pretty much showed us that the FPS could be about more than aliens, health packs and quad damage, and now it's back, having gone oddly full circle...

Dragon Rising has been developed with both the console and PC markets in mind, and a lot of that shows in the game's interface. For one thing, our PC copy features the ubiquitous (and silly, if you ask us) Press Enter message at every startup, and the menu systems are very obviously built around a gamepad. It certainly made us fear for the game's sense of verisimilitude, but then we loaded up the first mission, and most of our fears evaporated.

But that's not to say the game's perfect – far from it.

First up, the game looks stunning. The EGO Engine renders huge swathes of land at remarkable distances. It's no Crysis, but there's usually a lot more going on in the average Dragon Rising mission. Even in the early missions, there are multiple vehicles on land air and sea, dozens of soldiers, and all kinds of effects like persistent fire and smoke and destructible terrain elements. Combined with a

far more complex ballistics simulation, that the game runs smoothly at all is impressive. On our 4870X2-powered test rig, it looks great – truth be told, though, we wouldn't want to go much below that spec.

The game places you in charge of small bodies of soldiers in an active warfighting environment – you'll rarely be the only fireteam on the map. There'll be other squads, often as

part of secondary missions, helicopters, and assault vehicles, all tooling about to achieve the mission.

You control your small squad using a radial menu, obviously designed with the D-pad of a controller in mind, but perfectly workable via a key-press, and then navigated via WASD keys. It means you're stuck in place while you issue orders, but that's not too bad, and it reflects





the fact that you're taking a moment to ignore the AoE in favour of sorting out your squad or squadron. You can tell soldiers to move to certain points, to spread out, when to or not to engage the enemy and so on.

In practice it can take a while to get to the more detailed orders, but most of the time all you need to do is tell the squad to follow you, or to request healing from your medic.

Wounds are modelled in some detail and they can stop you from running or sprinting, affect your aim or even leave you in danger of bleeding out. They're not quite as persistent in game as they are in real life, but then even the most simulationist game must make some concessions for fun, and Dragon Rising strikes a nice balance.

Except for the fact that my squad medic has a bad habit of getting his head shot off just as I need a bleeder stopped. Hmm.

Order of war

The missions are structured in what are essentially linear points, but the combination of secondary missions and semi-random patrol paths keeps things interesting. For every 'go here, destroy that then this' mission, you get

more interesting ones with evolving mission parameters, like scouting a chopper crash site, finding the survivors, and then rescuing them.

Of course, these more complex missions, especially that pilot rescue scenario, start to show some of the game's inherent weaknesses, too.

Prime amongst them is the game's poor AI. It handles the enemy pretty well, who will advance, use cover, and effectively flank you at times, but not so much your own squad at times. The rescued pilots, for instance, though they're not frontline combatants at all, seemed to be running off the same set of directives – 'see bad man, shoot bad man', rather than 'I am so terrified, I better listen to this nice sergeant type trying to rescue me'. It added a frustrating element to what is otherwise a pretty enjoyable shooter.

In gameplay terms, our other only real complaint – and it's pretty vague – is that Dragon Rising doesn't seem to have the... flavour of the first one. The missions were just a bit more complex, more involved, and seemed far less on rails. There's still a lot of immersion to be had, and entertainment, in Dragon Rising, but it's like eating Domino's pizza compared to local gourmet pizza.

It's still pizza, and pizza is good, but

gorgonzola with pepperoni and basil tends to beat ham and pineapple every time.

You don't fight alone. Kinda...

Then, of course, there's multiplayer, and that's been a real disappointment. Despite promising it before launch, and despite even stating it's in the game as a feature on the packaging, Dragon Rising does not support dedicated servers, which has pretty much killed it as a competitive online PC game. Which is a shame, really, as when you do get into a game, or if you organise a co-op mission with friends, it's a lot of fun. It's not quite as deep or ambitious as ARMA II, but nor is it so buggy, either.

There's an awful lot of polish and work been put into Dragon Rising, from the detailed island the game is set on (a landmark realistic rendition of a real island between Russia and Japan), to the solid voice work (very much inspired, I judge, by Generation Kill). But it just falls short of being truly brilliant.

But we still really want to beat that damn pilot rescue with both of the bastards alive! DH

PC, Xbox 360, PS3 (reviewed on PC)

Developer: Codemasters

Publisher: Namco Bandai

Website: www.codemasters.com/flashpoint/

Graphics

Gritty and detailed, with great combat effects.

Gameplay

Lots of fun, but not quite as good as it thinks.

Sound

Great combat sounds and soundtrack.

86
77
91

Overall
Not quite on the mark, but entertaining nonetheless.



79%



Halo 3: ODST

Take a brief stroll in the shoes of a military everyman in the latest Halo instalment.

Here's a game that's splitting opinions like a MAC round splits ground targets. For some, ODST is a perfectly weighted, taut little addition to the Halo canon, full of great characters and gifted with a concise plot. To others, it's woefully short, light on classic Halo action, and simply not worth the full-game price tag. So what do we think?

Well, it split opinions in the office, too.

On the one hand, it's this writer's opinion that it's a top notch episode of the war between humanity and the alien Covenant. There's no denying the thrill that a Halo fan gets from hearing that familiar opening theme, and while the larger portions of the Halo soundtrack are absent, there's enough leitmotifs and cues in the opening sequence to get your pulse pounding.

From there, we're introduced to the main players of the game, a squad of typically hard-bitten ODST – Orbital Drop Shock Troopers, for the uninitiated – voiced by Firefly's Nathan Fillion, Adam Baldwin and Alan Tudyk, amongst others. They voiced some of the first soldiers you fight alongside in Halo 3, and their familiarity with the world helps establish the slightly different tone of this game, while making sure players know this is still the same gritty universe.

The game opens with a combat drop, apparently gone wrong, but possibly not. An

ONI operative drops with you, and it looks as though there is more to the mission than meets the eye. Even worse, your own single-person pod crashes way off course. When you eventually wake up, your squad is split up, and it's up to you to try and piece together what's happened to them.

This is the central conceit of the game – as you wander the deserted streets of New

Mombassa, you track down clues that hint at your squad's fate, which each in turn unlock a flashback to the action of the preceding 12 hours. It's an interesting mechanic, and it provides some great shifts in tone. As your character, known only as the Rookie, searches darkened streets avoiding and dodging Covenant patrols, you still get to play through some great themed sequences – tanks battles, sniper duels, and demolition missions.

The city is pretty open, too, so you'll likely unlock these chapters out of order, which adds to the almost detective movie-like quality of the central game. There are also hidden voice messages left throughout the city to collect, telling the story of a New Mombasa citizen just before the Covenant strike.



BOX OF RAGE

First and foremost, calling this a game is an insult to every other game and gamer out there. You get barely four hours of gameplay, covering fun things like "wandering around a big empty city until enemies show up" and "sitting through boring cutscenes until your eyes bleed".

These cutscenes might not be so bad, but in practice the entire engine looks like the original Halo 3 engine - run through a blender, textures bland-ified and antialiasing still not implemented. The female characters look like something you'd scrape off your boot, and the most detailed models seem to be the enemies you're shooting at. Which isn't saying much.

Even more confused is the ODST soldier you play as; no longer as badass as the Master Chief, your grenades are thrown about as far as a little girl could heft one, but you can still cart around 200kg+ miniguns and flip a Warthog that must weigh at least two tonnes. You've no damage shield, but you're granted so much health that even on Legendary difficulty you can wade through the battlefield, smirking in contempt against the ineffective bullets whizzing through your fleshy unprotected body.

Level design is relatively interesting at times, but halfway through the game the limited barely-a-year timeframe they had to develop with shows through and you're left to run through a series of cookie-cutter tunnels until a disappointingly quick end rears its head.

Sound is functional and while cameo appearances were sure to get fans excited, in practice the stars say nothing noteworthy or memorable, flipping banter back and forth in an attempt to seem likeable. This is practically impossible in a game shorter than a Hobbit's toe-hair; made even worse by disjointed 'flashback' scenes. A disappointing expansion pack that will leave you feeling ripped off and unfulfilled  JR



We could describe the gameplay, but if you've played any Halo game you know the drill. The only real difference is in your resilience, and some minor weapon changes. You're no genetically modified super soldier in this one, so you'll really need to keep an eye out for health packs, and be a little smarted in picking your fights. This is another area where the excellent voice acting

kicks in – as you take damage and fight on, your character's voice and breathing get more ragged, more desperate. It's a neat trick and works well.

One thing that has improved are the graphics. As we said in our preview back in issue 105, a lot of the areas in ODST are more open, more detailed. It's the same engine, but the devs have really learnt how to code with it to best advantage. From the burning highrise buildings of New Mombasa to the fiery insertion that starts the game, ODST is never anything less than cinematic.

It's also cinematic in its length. You can finish the game in a single weekend, and it's entirely possible to rush through in only four or so hours. At a time when many games boast run times in the hundreds of hours, this might seem like a serious rip-off; we don't think so, but many do, and this is what really split opinions in the office.

Personally, I love the length; it's great to be able to finish a game in that amount of time, and then look forward to repeat playthroughs, looking for all the secrets, unlocking Achievements, and enjoying the voice-acting. And you get a lot of multiplayer, too – all the previously released Halo 3 maps, standalone, plus the new Firefight mode for ODST.

Firefight pits you and three others in a co-operative battle against waves of enemies. You share lives and equipment, so working out the best strategy to defeat each wave – which also have a few tricks up their alien sleeves – is the key to winning.

Halo 3: ODST is a game that isn't for everyone. It could well be argued that it is merely a sop for the fanboys, a gross example of taking advantage of your fanbase. But, having played and completed all the Halo games so far, I really don't feel taken advantage of. ODST's story and action is just as compelling as previous games, and its characters just as memorable.

And I am taking advantage of that second (and subsequent, I'm sure) playthrough – what greater praise can you give a game?  DH



Xbox 360

Developer Bungie
Publisher Microsoft
Website www.bungie.net/Projects/odst/

Graphics
Detailed and atmospheric, with great design.

84

Gameplay
Gameplay: Nothing groundbreaking, but still engaging.

81

Sound
Captain Mal Reynolds – 'nuff said.

96

Overall:
A lot of fun, but too short for some.



88%



Cities XL

A surprisingly deep and addictive new city sim - with an online twist.

It takes a little while for the cities you create in Cities XL to indeed become extra large. That's even assuming you get that far; your city could end up a polluted mess, full of angry unemployed bums, or even go bankrupt during an unfortunate crash. But the true testament to Cities XL is that you will almost certainly come back to it to try again and again.

City building sims used to be a dime a dozen during PC gaming's golden age, with none bigger or better than the classic Sim City. That game, however, took a more scenario-based approach to virtual urban development. Cities' biggest claim to fame is that it does away with this structure, instead presenting you with a range of blank slates, and the constant challenge of monitoring your metropolis' growth. In the offline solo mode, you choose what kind of environment you want your city to occupy, from simple coastlines to mountains to archipelagos to, well, all kinds of places. It's this choice that sets the difficulty of each game; coastal settlements are relatively easy, for instance, while deserts are tougher.

Your chosen plot of land starts empty, unlike your bank account, which has \$400,000 in it. The first thing you need to do is build a road into the map, then a Town Hall, then a utilities building. From that first plot of land, you start losing money, and that bank account ticks down every five or so seconds - you need some industry to get money coming in, and that in turn needs workers, who'll need place to live,

and shops to waste time at and... on and on.

That right there is the basic mechanic, and it didn't take me long to actually achieve a pretty neat balance. But to get the most from the game, you'll want your city's population to grow, as that's how you unlock bigger and better structures. And that growth is fiddly. The game models all kinds of population satisfaction



levels, and economic variables, so much so that the more time you put into the game, the more complex and involving it gets. As time passes, you'll be stockpiling excess goods, and you can use these to trade for goods your city lacks.





To be honest, I really wasn't all that excited by Cities XL, but I'm already wanting to play more, even as I'm typing this! But the game is not without its flaws, and those are very evident during the game's planet mode.

All the world...

Cities XL's neatest trick is turning the city sim into an MMO. In Planet Mode, you log onto a world of thousands of player-made cities. Not only can you visit this to see what other players are up to, but you can also trade with other cities, bringing the game's economic model to staggering life. It's a brilliant idea, but for one thing... the game's short tick between profit/loss periods.

As we said, you make or lose money by five second increments. More than once during testing we had the game hang on us; there is a syncing system to 'save' your city server-side, but as far as we can tell most action happens client-side, but during crashes this sync is less than perfect. We'd log back in to what had been a thriving economy, only to find we'd lost tens of thousands of dollars, and more every second. Basically, during our crash, the game had not

terminated our session, and the inevitable restart time was all it took for our carefully balanced society to fall into galling crisis.

This must be how all those US execs felt last September, when the bottom fell out of the global economy while they were playing nude midget golf, or whatever it is rich people do.

It's a real shame, as not only is this game fun, it's kind of inherently both educational and pleasingly optimistic. There's no real fail point, just greater levels of challenge; there's no real mechanic for doing anything by force, either, so no invading that neighbouring city for its vast oil reserves. It would be great to see this put on, for instance, school PCs, to teach kids about urban planning and environmental impact, and social drivers like job availability economics.

Looking good

Apart from mechanical depth (and some flaws) the game also sports a very solid graphics engine. The camera views each map at a number of levels, and while that zoom isn't Google Earth smooth, it's still very effective. At lower levels, too, each city comes alive, full of



flowing traffic (a great way to spot traffic snarls that might be impeding growth), wandering civilians, and all kinds of touches like advertising and classy shopfronts. There's a lot going on though, so if a beefy system will likely help if you want to take true advantage of the game. Even our NRG test system, packing a 4870X2, felt the pinch every now and then.

Embarrassing as it may be, we're growing awfully fond of this game. It's simple, non-structured play hides vast depth and almost limitless potential for experimentation, and that's simply not something you can say about a lot of games these days.  DH

PC

Developer Monte Cristo
Publisher Namco Bandai
Website www.citiesxl.com

Graphics
Lots of depth and variety. 

Gameplay
Surprisingly addictive and relaxing. 

Sound
Does the job. 

Overall
With a bit more polish, this could be the ultimate city sim.

86%





Aion

The MMO gets wings in this newly localised release.

MMOs – and interesting, unique MMOS, at that – are seeming to be coming out every month. They're not always good of course (like Champions Online), but it's nice to see developers making the effort to get from under the shadow of World of Warcraft. Aion, the new angelic MMO from NCSoft, also takes a few interesting liberties with the genre.

In Aion you play as one of two factions, who are essentially good and evil, locked in an eternal war over their shattered, floating island continent. It's a classic set up for PvP, and that features very heavily in the game's mechanic. You can raid enemy lands early on (though it's kinda hairy), and at level 25 you get access to the Abyss itself, the region separating the two shattered worlds. Crafting, too, is pretty heavily woven into the game, leaving Aion as one of the most integrated games in terms of its systems. Sadly, the same

thought that went into making the game smooth at this system level is lacking elsewhere.

But more on the faults later.

The initial experience of Aion is pretty solid, starting with a very detailed and colourful character generator. It's not as truly varied as some games – Age of Conan comes to mind – but given the art style and angelic feel of the game, that's not surprising. Once in the world, the first ten levels are pretty much classic early game MMO – pick up quest, kill ten Xs, hand in, rinse and repeat. The world you quest in certainly is pretty, and the CryEngine does a great job with some over the top combat effects and ethereal backgrounds. The game's easily on a par with Lord of the Rings Online, which is widely regarded as one of the best looking MMOs on the market.

At level 10, though, the game changes up a gear when you gain the ability to fly. This operates on a timer, and there are many areas of the world where you can't actually fly, only glide (which seems bit of a cheat – "Have wings! Fly... haha! Psyche!"). Still, it's faster than running, and helps set Aion apart. And it needs that, too, because once you get used to the visual splendour, the grind really starts to set in.

Aion seems to be, in part, a bit incomplete in terms of quests. To make it through to the end-game and the more solid PvP part of the game, you'll have to take advantage of repeatable – and repetitive – quests. Sure, on the flipside, Aion lets you earn XP from crafting (and the crafting is actually useful!), but the repetitiveness can really work away at any sense of enjoyment or exploration that Aion engenders. Combined with what is effectively a too-small world (only five regions per faction), and the game is starting to look a little tarnished.

Sure, when you do get through that boring

mid-game, the PvP stuff is really cool, especially with the timed flight mechanic. A good stoush between experienced players is a thing to behold. The fact that crafting (did we mention it's useful) actually gives you good gear that can rival that dropped in the 'wild', and at last we have an MMO that isn't quite so locked into the idea that gear is more important than skill.

But, again, there's a negative flipside, as there's very little real customisation you can delve into to make your character unique. This almost makes the fighting-based endgame more of an action game than an RPG or MMO. Certainly, in terms of classic end-game content – large multi-party raids or world events – Aion is very lacking, though future patches may well attend to this (we have no official word on these).

There's no doubting that Aion can be a lot of fun, and that it gets a lot right, but it falls just shy of being the next great MMO. Hopefully, NCSoft's plans for monthly content patches will flesh out the world a bit more, and add more stuff to do at higher levels. For now, though, it's worth looking at, but it may not be quite ready to keep you hooked.  DH



PC

Developer NCSoft
Publisher QVS
Website www.aiononline.com/en/

Graphics
Very colourful and atmospheric, with great character animations.

81

Gameplay
A touch too repetitive in parts.

74

Sound
Some... annoying voice acting detracts from otherwise solid work.

76



Overall
Not quite curing us of our Lord of the Rings Online addiction.

77%



Uncharted 2: Among Thieves

One of the prettiest games ever made is also short on content – is it a good combo?

Uncharted 2 was already earning big accolades by the time E3 had been and gone – the kind of high praise that makes you think it may well all be for nought when the actual product ships. However, this PS3 exclusive is the kind of title that'll have even hardened PC veterans thinking twice about at least dabbling in console land, and it may well be the high-end action shooter that the PS3 has been so desperately craving.

Nathan Drake is back on the adventure trail, this time hunting down the mythical Shangri La and some mystical giant gem. It's all very pulp adventure, but then again, that's exactly what this game is – an Indiana Jones for the modern age, with an AK-47 instead of a whip.

The game is short – though not as short as ODST – but so perfectly crafted in its pace that you really won't mind at all. It opens with a classic set piece, and never really relents, whether you're in a serious gunfight, jumping between buildings, or simply sitting back and enjoying a cut-scene, pretty much every moment of the game delivers.



On the action front, the third person gameplay is full of unexpected depth. There are gruesome stealth kills, explosive grenade fun, and a range of firearms to throw lead down-range. The cover mechanic is a bit hit-and-miss, but you rarely feel anything but exhilaration from the action you're watching in screen. Even when you mess up, it plays out wonderfully. There's one sneaking sequence where we managed to score a near perfectly silent kill, but within sight of three well-armed baddies – there was a pause, all of us looking at each other, and then... pandemonium. Grenades, bullets flying, furniture cracking apart. It was over quickly, but it got our heart rate hammering like few gunfights in gaming ever have.

There are platforming elements, too, but they are so well laid out and executed that they'd make Lara Croft blush. Taking a page out of the mediocre Mirror's Edge's book, certain world elements are colour-coded, though far more subtly than Edge. Even at a dead run across a roof top covered in fluttering prayer flags, you'll be able pick out weight-bearing pipes and ledges to jump on and scramble over.

Often, the platforming elements combine with the gunplay, too. You might be jumping along a series of upper story building facades, while down below nasty men are shooting up at you. The great sound and level design combine here too, and in some instances you'll need to be very tricky to use the available cover to nimbly evade your foes.

And did we say colourful?

Developers Naughty Dog have put together their own Naughty Dog Engine, combined with the Havok physics engine, to create one of the

most vibrant gaming experiences you'll ever see. There's not a single colour that doesn't seem as vibrant as it possibly can be, and the play of light and shadow, depth and vision, is without equal. We might sound like we're breathlessly excited and beyond real criticism, but we're not – this is just about the most visually impressive game we've ever played.

All the voice acting is great, the game's plot rumbles along nicely to a wonderful set piece finish that'll leave you grinning. As we said, it's short – you can probably finish the game in a weekend. But then you get to dive into multiplayer.

There are a range of ranked competitive modes, a very solid co-op mode, and a Survival mode, which is pretty much the classic 'beat all comers' level that Gears of War has made so popular.

If we could convince someone to bring this game to PC, we'd be very happy little gamers. There's no doubt it could look even better on a beefy gaming rig, running at all kinds of insane resolutions. But as it is, it is the best looking game on PS3 to date, and has such moments of design brilliance that we could even justify buying a PS3 to play it.

It's that good.  DH

PS3

Developer Naughty Dog
Publisher Sony
Website www.unchartedps3.com

Graphics
The most colourful we've seen. **96**

Gameplay
Only the most minor of niggles keep this from being perfect. **98**

Sound
Great voice acting, awesome foley work. **93**

Overall:
Just get a PS3 already – it's that good.

95%



Borderlands LAN Night

Beer, pizza and LANning. All the elements of success!

If you've never experienced the relative hassle of ripping apart your precious rig (with speakers and monitor carefully balanced around the mess of cables and spare expansion cards) to take it to a LAN then you've missed out on something great, but thanks to Atomic we had a LAN already set up just waiting for players.

The game of choice was Borderlands, a funky game by 2K that we've covered extensively in an engine room, but one that allowed Atomicans to come together in teams of four to challenge each other to a race for supremacy - and the game hadn't even been released yet!

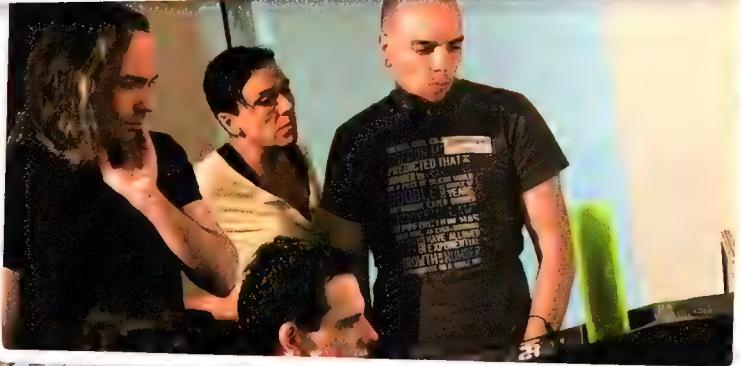
Five teams of four players each slid into the comfortable shoes of the game's four characters (Brick, Roland, Lilith and Mordecai), tasked with defeating one of the earlier Borderlands foes Nine Toes. He was a little more evil than a simple missing toe implies, proving quite a challenge.

Team Thorium won the challenge in a time of only 6:17.40; beating out Plutonium, Cadmium, Caesium and Uranium and managing to win themselves copies of the game on PC, a signed Borderlands poster and a brand-spanking new Cyber Snipa mouse from Digital World Warehouse!

Of course it wouldn't be complete without Team Atomic having a go; David Hollingworth, myself, iamthemaxx and a 2K rep blasted through the same course as everyone else in the blistering time of only 4:50.

A huge thanks to all the Atomicans who came along on the night and scored a bag of swag, as well as 2K games for giving us exclusive access to the code for not only this LAN, but also for our Sydney and Melbourne Power to the PC Tours!  JR







Forza 3

The only racing game you'll want for this generation of consoles.

Racing games have predominantly been limited to a few stand-out titles, and when Gran Turismo 4 launched in 2005 it met tough competition in the form of the first Forza game. These were for PS2 and Xbox respectively, each harnessing the relatively small power of the consoles at the time to give a somewhat limited impression of what it was like to burn around the track in a power car. The launch of Forza 2 came and went on June 14 of 2007 without a matching release from the opposition. Now we're well into the end of 2009, and Forza 3 comes to the track unopposed – but it's shaping up to secure the lead indefinitely.

After first throwing the disc into the tray expectantly, an announcer guides you through the more basic controls in a voice almost identical to Jeremy Clarkson of Top Gear fame. He explains that you'll need to install the second disc to get the 'full experience', which equates to 1.9GB of HDD space and an additional buttload of cars and tracks to play with. This might be a pain in the arse if you're stuck with a 20GB launch console and not much free space, but sacrificing the space pays off with stunningly beautiful tracks that are the most enjoyable in the game. Of note are the tracks around Fujimi Kaido in Japan, lavishly detailed with sheer sandstone cliffs and surging waterfalls,

and sharply twisting roads that lead through forests of evergreen trees. It's so impressive that you'd swear you were looking at a computer-generated version of the real thing, and even more astounding is that the game manages to pack in this much detail and keep running at a solid 60fps! Unfortunately with so much detail comes longer loading times, taking up to 30 seconds at times to load a single race!

The announcer then guides you into the venerable Audi R8 5.2 FSI Quattro, a car that boasts acceleration to 100km/h in 3.9 seconds and a top speed of 316km/h. Ripping around one of the easier tracks faster than a box of bran flakes will pass through your digestive system, the sheer sense of speed is matched perfectly by the responsive controls and sound effects. Every squeeze of the accelerator brings an equally deep roar from the 5.2 litre engine, tires squealing slightly as the car burns off the outer layer of rubber and leaves it stuck to the tarmac as it leaps forwards.

In total there are over four hundred cars to choose from that are all colour customisable and over 115 tracks to race on, as well as specific upgrades covering everything from the clutch to the air filters. It can even simulate the tire wear, petrol consumption and everything that a real racer would have to worry about – but

all these ultrareal options are matched by a completely arcadey counterpart. If racing sims aren't your thing, just turn on the suggested line that appears as a series of green arrows that turn red as you're going too fast. If manually shifting gears is too hard you can turn on auto transmission; if you can't wrap your head around the brakes then ABS braking steps in to help out. These settings can all be tweaked while in a race, so there's no reason not to get the game as challenging as you'd like it to be.

One feature that sounds good is the rewind button, quite literally turning back time with a cool slow motion backwards effect that gives you the chance to redo corners where you might've accelerated just a smidge too much and gone careering off into the barrier. Unfortunately this pops up every time you so much as touch the edge of the track, and it can detract from the fun of racing by offering an easy way out, as well as offering anal gamers the possibility to get every single corner perfect.

Forza 3 is an improvement on the second in every way and from the first time you play to the last lap you race before stopping some hours later, it's a game that keeps on giving.

Xbox 360

Developer Turn 10 Studios
Publisher Microsoft Game Studios
Website <http://forzamotorsport.net>

Graphics
 Takes a stab at real life, and almost replaces it.

Gameplay
 Solid simulation, accessible for newbies, long loading times.

Sound
 Generic soundtrack, but the car sounds are impressive.

97
90
85

Overall
 One of the best games of 2009.

92%



FILM REVIEW

The Imaginarium of Dr Parnassus

A failure of the imagination, or a triumph of it? Kinda both...

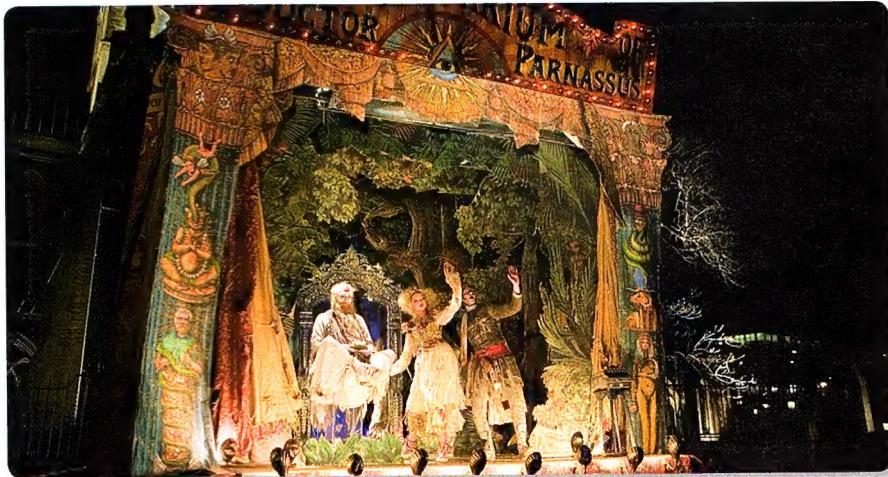
Yes, Terry Gilliam has made some wonderful films, but is *The Imaginarium of Dr Parnassus* one of them? Or is it bit of a failure?

It's really hard to judge, actually.

In terms of plot, it's almost autobiographical, in a whimsical way. Dr Parnassus is a travelling performer doomed to eternal life after a series of wagers with the devil, artfully played by Tom Waits. His horse-drawn stage show is a decrepit front for the ongoing feud between the two figures, and Parnassus' desire to open minds and perhaps save a few souls never quite seems to get off the ground. Christopher Plummer delivers a wonderfully broken down performance as Parnassus, and one can only imagine how Gilliam set about directing such a glum figure.

One of the last wagers between the two concerns Parnassus' lovely young daughter, Valentina, who is doomed to belong to the devil – or Mr Nick, as the film styles him – when she turns sixteen: which is about three days away. She's unaware of this, though she slowly learns the tale from her father, which unfolds as a series of fabulous flashbacks.

Terrified of losing his daughter, Parnassus finds himself in yet one last wager. Mr Nick, it seems, is nothing if not generous, and he offers a last bet – first to save or condemn five souls (souls are the coin of the realm, for these two) keeps the girl. Which is complicated – of course – by the seemingly random (or is it) discovery of a man (Heath Ledger in this last



role) hanging beneath a London bridge, near death, and saved by the kindness of Valentina.

It's difficult to tell what the main thrust of *Imaginarium* is, and it comes with a lot of big ideas. Is it a coming-of-age film, a romance, or a redemption tale? If it is a redemption tale, who are we wanting to see redeemed? The old, wise and yet somewhat bumbling Parnassus, or the confident young trickster, Ledger?

It's a bit of all of that, really, and *Imaginarium* suffers for it. There's lots to love about it, of course; Waits is delightfully wicked and oily as the devil, Lily Cole is nothing short of stunningly beautiful and alluring as Valentina, and even Verne Troyer is a laugh as Parnassus' ancient assistant. The costumes are stunning, the model work and CGI backdrops of Parnassus' mystical imagination are wonderfully executed, and even the trick of replacing Ledger (who died during filming) with three different actors for various portions of the films works well.

Certainly, Ledger's death caused problems with the production, and years passed during

breaks in filming. It must be hard to even get a project like this going after such setbacks, so perhaps we should be lauding Gilliam's stubbornness more than lamenting that he failed to deliver.

But, in the end, we should at least be thankful that someone is still trying to make movies like this, even if they don't always measure up. Perhaps that's the tale that *Imaginarium* really wants to teach us – we can only ever do our best, and we should never, ever give up trying.  DH



DISC OF THE MONTH

Releases are starting to ramp up to year's end, now, and our DVD and Blu-ray collection is getting dangerously close to being tall enough to cause real harm if it topples over! But there's a solution to that – watching a lot of stuff!

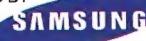
It's been a good month for sci fi, with the *Torchwood* miniseries *The Children of Earth* coming out. It's a solid tale that only just falls short of being the best thing the show's ever done, but it still packs an emotional punch and has plenty of man-love in it. And some really gross aliens. We got our b-grade on with the 40k knock-off *Mutant Chronicles*, the movie based on the comic, based on the game, that was in turn based on another game. It's certainly not A-list material, but it's got

Ron Perlman and lots of big guns and exploding heads, and we're pretty easy to please on that front. It does, however, have the worst, most abrupt ending EVER.

But for cinematic awesomeness, we're turning to an older film, that's finally gotten a HD release on Blu-ray. *Heat*, the crime epic from Michael Mann, has always been on our high-rotation list of films to watch, but it's now even better in full HD. From Mann's obsessive brilliance with light and shade, to the impressive score and soundtrack, it's almost like watching the film for the first time all over again. And if you've never seen the defining cops and robbers tale of the last twenty years, now is the perfect time.



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Old Man Murray

Ben Mansill insists that you read every single damn word on the greatest games site that will ever be.

This month's Fallback is aimed right at your face – if your face has never heard of Old Man Murray it's www.oldmanmurray.com and OMM from now on. There are now more gaming websites out there than there are undiscovered exoplanets, and while both lists keep growing, there is and will forever only be just one games site that sits atop the world of games sites, and funny shit.

Old Man Murray was born in the fledgling years of the internet, and its faithful and equally fledgling companion – games journalism. Back then, being 1997/8, games sites were all of the same ilk. In short, they took themselves way too seriously. In long, they punched out excited announcements about upcoming games, they rolled out too many 7.5/10 reviews, and they occasionally published an interview with Peter Molyneux with an expectant tone of impending journalism gold medals for the effort. For stuff about fun, games sites were joy-suckers. Games journoes thought like sports journoes and wrote like them, not knowing any other way.

And then one day a couple of dudes called Erik and Chet started OMM. But not with a bang so that when most people heard of OMM it was word of mouth, like a cool underground band, and when first checking it out, it felt like it had been going forever and there was much lost time to be made up by going back and reading every word. OMM is a dirty underground site that never, ever pandered to anyone or anything, was on a mission to drive away potential advertisers, and – like a real punk band – that just drove their popularity and respect.

OMM is a bitter and twisted, hateful, cruel and vicious voice. Equally, it can be joyously, effusively adoring of good things, but never the good things you expected. It is a voice of reason and sanity, of cut-through-the-bs reality, with equal measures of impossibly ridiculous pontificating. Of intense focus on the irrelevant and with frequent references to the unexpected. And the thing, the thing, is, that it's all done so beautifully perfectly naturally. Erik and Chet's personalities are not contrived, they aren't acts; when reading OMM you instantly fall under their spell and love them. Nobody writes with Erik's masterful poetic flow of the absurd, or with Chet's brutal sledgehammering. They aren't try-hard wankers, though they have spawned a generation of copycat try-hard wankers, trying to emulate the unmatched style of OMM. They are the original and the best.

OMM is, IMHO, the funniest site on the internet. No contest. Even to this day, I go back and re-read stuff over and over when the mood is right. It's always insanely brilliant. You find stuff

you never saw before. You love them more. You will, after putting down this Atomic, rush straight to the site, with a beer, and dive in. You'll be lost for hours. OMM did reviews, the best in the business and about as un-reviewy as can be, while somehow capturing the essence of what's important. Their features are stunningly original and brilliant, their news, little nuggets of hysterical hysteria. To help you on your way, here's my pick of OMM essentials:

Kiss Psyco Circus Review

/longreviews/66.html - My all-time favourite piece of games writing. A masterpiece of structure and a chasm of counter-point. *"Third Law's putative KISS game is powered by LithTech. Since I have a financial interest in badmouthing LithTech, I was immediately prepared to blame the entire "lack of KISS" debacle on Monolith. I sent Jason Hall some mail asking him if LithTech is powerful enough to render KISS, because, I went on, I doubted it could. I forgot to send the message through one of my troublemaker HotMail accounts, but Hall responded anyway. In between descriptions of some of the different ways he's going to beat me up if he ever, ever, gets his giant hands on me, he answered my question"*

Crate Review System

[/features/39.html](#) - Now super-famous, genius funny and typical of OMM's mission to cut down mediocrity. Rates a game on how long til you see the first crate.

No One Lives Forever review

[/longreviews/751.html](#) - "Don't get us wrong, Jason Hall could invent a photo of Jennifer Love Hewitt's tits that converts dirt into hundred dollar bills, and it still wouldn't make up for the *Blood 2* mission pack."

Serious Sam developer interview

/features/73.html - OMM made Serious Sam the mega hit it is. Fact.

All of it, really. Every. Single. Word. Shiny. Gold. Go read; love. OMM raged hard for just three years, then suddenly it all stopped. The wonderful forums were killed off, but the main site is up and should be forever. A couple of years after OMM got rolling the almost-equally ultra site Something Awful started up. Possibly inspired by OMM. Look at how huge Something Awful is now, and how it holds fast the same irreverent non-values Erik and Chet created. This is the fame Erik and Chet turned their back on, and that's as cool as it gets.

OLD MAN MURRAY

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America Wins The War

As much as we enjoyed not updating as a condition of our advisory position in service to the U.S. Government during our recent war against Terrorism, we're really back. As a big welcome back present to ourselves, we took a break and didn't update for a while longer. It's all old.

12 Days of Christmas, Complaints About Return To Wolfenstein
"12 Days of Christmas and Complaints About Return to Castle Wolfenstein" is the title of a new column that appears weekly in the *Washington Post* to discuss the latest video game. So far, it's been written by the author of this article, who has been writing the column since the first issue of the magazine. For those of you who celebrate Chanukah, feel free to think of the article as "12 Days of Christmas and Chanukah Success".

America Under Attack

We're not gonna pussyfoot around this: Terrorists blew up the World Trade Center. We know it and you know it, and there isn't any other topic that's been more discussed in the aftermath of it. As much as we'd like to believe that the amount of coverage given to it was the new possibility that we might get to see Col. Stevens killed on television, it wasn't. Finally, it's the first exposure at what will probably be the last. And it's not even the most interesting part of the story. The stars of stage and screen, Eric! all cried out now and here's only one left in the parts of his head where tears could be. There's only one left in the parts of his head where tears could be. That's all he knows, and that's how he plans to avenge us.

E 2001

Starting at the airport, where I bought a copy Daniel Evans' novel "Glory Hole," thinking it was a tale of bravery in the trenches during World War I, I found myself in a world of mystery and suspense. The big shock this year: Glory Hole is not a military story. But like the novel "Glory Hole," E turned out to be pretty good. Well, I guess I'm taking enough about many stories for one update, so I'll start over again and just think about them while you read E 2001. www.ew.com

Welcome Back Message

I'll be honest with you: I don't know what happened. To make up for our interaction with you, I've written a letter of explanation that includes three or four hidden messages. All of them are in plain sight. The letter also includes a map of Black and White. Remorsefully, no apology for the raps will be necessary since it's partially responsible for the G-rated/PG-13 rating on a 1998 sitcom guest starring Tim McWayne.

Serious Sam: The Second Interview

Serious Sam's out. To reiterate, we've landed yet another exclusive interview with Friedman's domain. Shhhh... It's a secret again stick it to the Man. You can't tell anyone. You can't tell your mom. You can't tell your Roman. You don't have to be against the Man to enjoy this interview. In fact, if you do, you're not doing it right. So here's the interview by providing three points of entry. Click here, here, here.

2000 Edgy Game of the Year Awards

We are back with our first ever end awards. Every day for the next six days we will be giving out an award in a new best category.

Best

- Best Titles**, *A Screen Shot*
- Best Plot**, *Death Race 2000*
- Reviewers' Gift**, *The Wreckin' Zone*
- Best Soundtrack**, *Death Race 2000*
- Best Music**, *Death Race 2000*
- Best Visuals**, *Death Race 2000*
- Best Special Effects**, *Death Race 2000*
- Best Action**, *Death Race 2000*
- Best Storyline**, *Death Race 2000*
- Best Overall**, *Death Race 2000*

So, if you have a game you think is the best in its category, stop mailing in and offer us your game. We will make a difference, a very reader like you can help. Just drop us the image on the right and print out as many as you want. We will publish them in the order they come in. For maximum coverage - make your own and vary the width color. Thanks.

Reward!

I have recently lost my black plastic briefcase. I will make it worth your while to mail me.

PO BOX 02701
Cleveland OH 44101

We will send a special reward if the money is intact when we receive it.

FREEDOM! First Resistance Review

Unlike every other guideline, this rule won't give you the opportunity to tell you right from the very first paragraph how we feel about a game. Instead, we're going to state a few facts, drop a couple of subtle hints, and then only tell you whether or not we like the game at the very end. See if you're clever—and travel—enough to guess our opinion. Before we explain what...

American McGee's Alice Review

An OMM First! In an edgy display of opinion-pivoting, we review *American McGee's Alice*. The game is based on the original Alice of them... Click on the word *cards* to find out which one.

Dreamcast Contest

Just in time for Christmas, we're giving away a Dreamcast and five great games. To enter, just post a comment below key is working, so prefer the three extraction points. You can enter at any time during the previous month! For once we thought ahead and actually had all the prize stuff set up before hands we announced the contest.

Alice in Wonderland
An *Edgy* Musical Comedy

No One Lives Forever Review

No One Lives Forever rocks! *NOT* SASIMI

The boys keep busy these days. Both do work for Valve, as well as helping run Portal of Evil. Erik wrote the dialogue for GLaDOS in Portal, as well as most of the dialogue in Psychonauts. So he's deep inside the business, but showering it with his talents in a new good way, for us. We salute you, Erik, Chet and QMMS! 



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Radeon™ HD 5870

Video Memory: 1GB GDDR5

Engine clock: 850MHz

Video clock: 1200MHz (4.8Gbps)

Memory interface: 256bit

DirectX® support: 11

Output: Dual DVI + HDMI + Display Port



Radeon™ HD 5850

Video Memory: 1GB GDDR5

Engine clock: 725MHz

Video clock: 1000MHz (4.0Gbps)

Memory interface: 256bit

DirectX® support: 11

Output: Dual DVI + HDMI + Display Port



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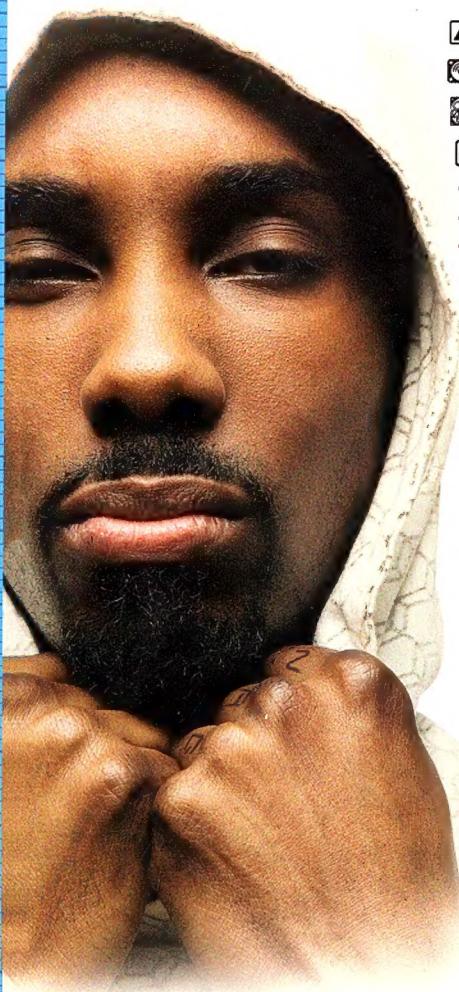
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- Dual NVIDIA® GeForce® GTX 295 1792MB GDDR3 SLI® technology
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"It's nice to know that such power has been invented." February 2009, APC Magazine.
"If you need absolute pants-soiling performance and you need it now then look no further" March 2009, PC PowerPlay.



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